60461620 D

CONTROL DATA

CDC® CYBER 180 COMPUTER SYSTEMS MODELS 840, 850, 860, and 990

CDC® CYBER 845S, 855S, 840A, 850A, 860A, 990E, AND 995E, COMPUTER SYSTEMS

CDC® CYBERPLUS PARALLEL PROCESSOR SUBSYSTEM

POWER DISTRIBUTION AND WARNING SYSTEM

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

REVISION	DESCRIPTION
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B (05-01-86)	Manual revised; includes Engineering Change Order 47859. This edition obsoletes all previous editions.
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REVISION LETTERS I, O, Q, S, X AND Z ARE NOT USED.

Address comments concerning this manual to:

Control Data Corporation
Technology and Publications Division
4201 North Lexington Avenue
St. Paul, Minnesota 55126-6198

or use Comment Sheet in the back of this manual.

PREFACE

This manual contains power distribution and warning information for the CDC® CYBER 180 computer systems, Models 840, 850, 860, and 990; CDC CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E computer systems; and the CDC CYBERPLUS parallel processor. The manual is for use by training and Engineering Services personnel who operate and maintain the system. It is organized into the following sections:

General Description

Provides a brief description of system configuration and of the equipment units which comprise the systems.

Operation

Contains a description of unit power controls, unit power procedures, and system power procedures.

Installation and Checkout

Refers to other applicable manuals.

Theory of Operation

Combined with Diagrams section.

Diagrams

Contains block diagrams with related descriptive text and schematic diagrams.

Maintenance

Contains maintenance and field removal/replacement procedures.

Parts Data

Contains parts information to the field replaceable unit level.

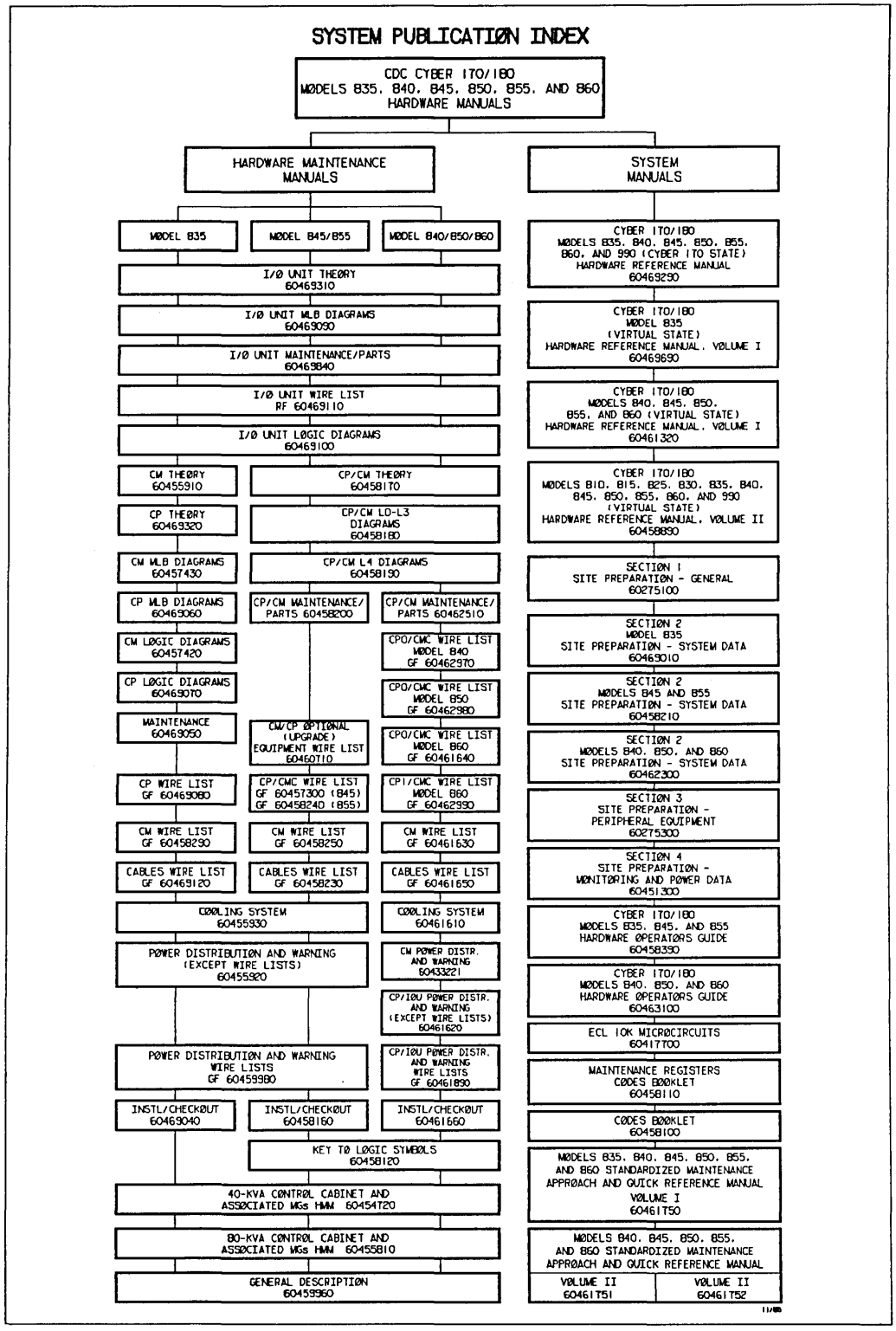
The CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E systems contain certain equipment units which are also used with other Control Data computer systems. Where applicable, this manual refers to the manuals associated with these equipment units. Refer to the following pages for manuals related to CYBERPLUS. This manual does not contain wire lists. For wire lists and other associated manuals, see the system publication indexes for CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E.

Following is a list of hardware manuals related to the CYBERPLUS Parallel Processor System. All manuals may be ordered from:

Control Data Corporation
Literature and Distribution Services
304 North Dale Street
St. Paul, MN. 55103

Hardware Manual	Publication Number
CYBERPLUS Parallel Processor Hardware Maintenance Manual, Volume 1 Installation and Checkout	60461740
CYBERPLUS Parallel Processor Hardware Maintenance Manual, Volume 2 Maintenance and Parts Data	60461850
CYBERPLUS Parallel Processor Hardware Maintenance Manual, Volume 3 Diagrams	60461830
CYBERPLUS Parallel Processor Hardware Maintenance Manual, Volume 4 Troubleshooting	60462390
CYBERPLUS Parallel Processor Hardware Reference Manual	77960981
CYBERPLUS Parallel Processor Wire Lists	60461870
CYBERPLUS Parallel Processor CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E Cooling System Hardware Maintenance Manual	60461610
CYBERPLUS Parallel Processor CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E Power Distribution and Warning System Hardware Maintenance Manual	60461620
CYBERPLUS Parallel Processor CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, and 995E Power Distribution and Warning System Wire Lists	60461890

Control Data Publication	Publication Number
25-kVA Frequency Converter Hardware Maintenance Manual	60456520
40-kVA Control Cabinet and Associated Motor-Generators Hardware Maintenance Manual	60454720
80-kVA Control Cabinet and Associated Motor-Generators Hardware Maintenance Manual	60455810
Large and Medium Scale Computer Systems Site Preparation Manual, Section 1 General Information	60275100
CYBERPLUS Parallel Processor Site Preparation Manual, Section 2 System Data	60461720
Computer Systems Site Preparation Manual, Section 3 Peripheral Equipment Data	60275300
Computer Systems Site Preparation Manual, Section 4 Monitoring and Power Data	60451300
Site Environmental Maintenance Handbook	60424500
CYBERPLUS Parallel Processor Maintenance Software Manual	60461730
Concurrent Maintenance Library (CML) Reference Manual	60455980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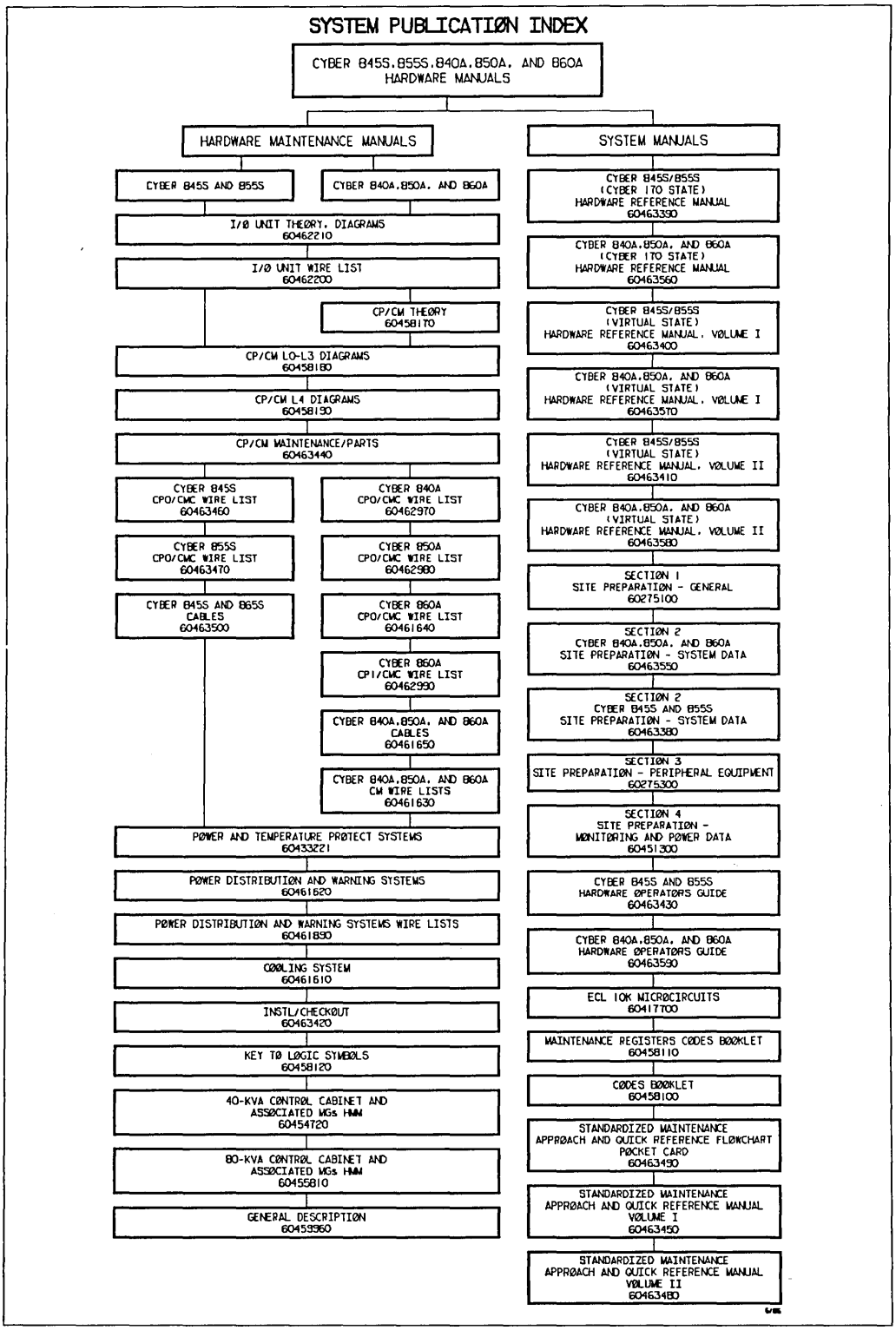
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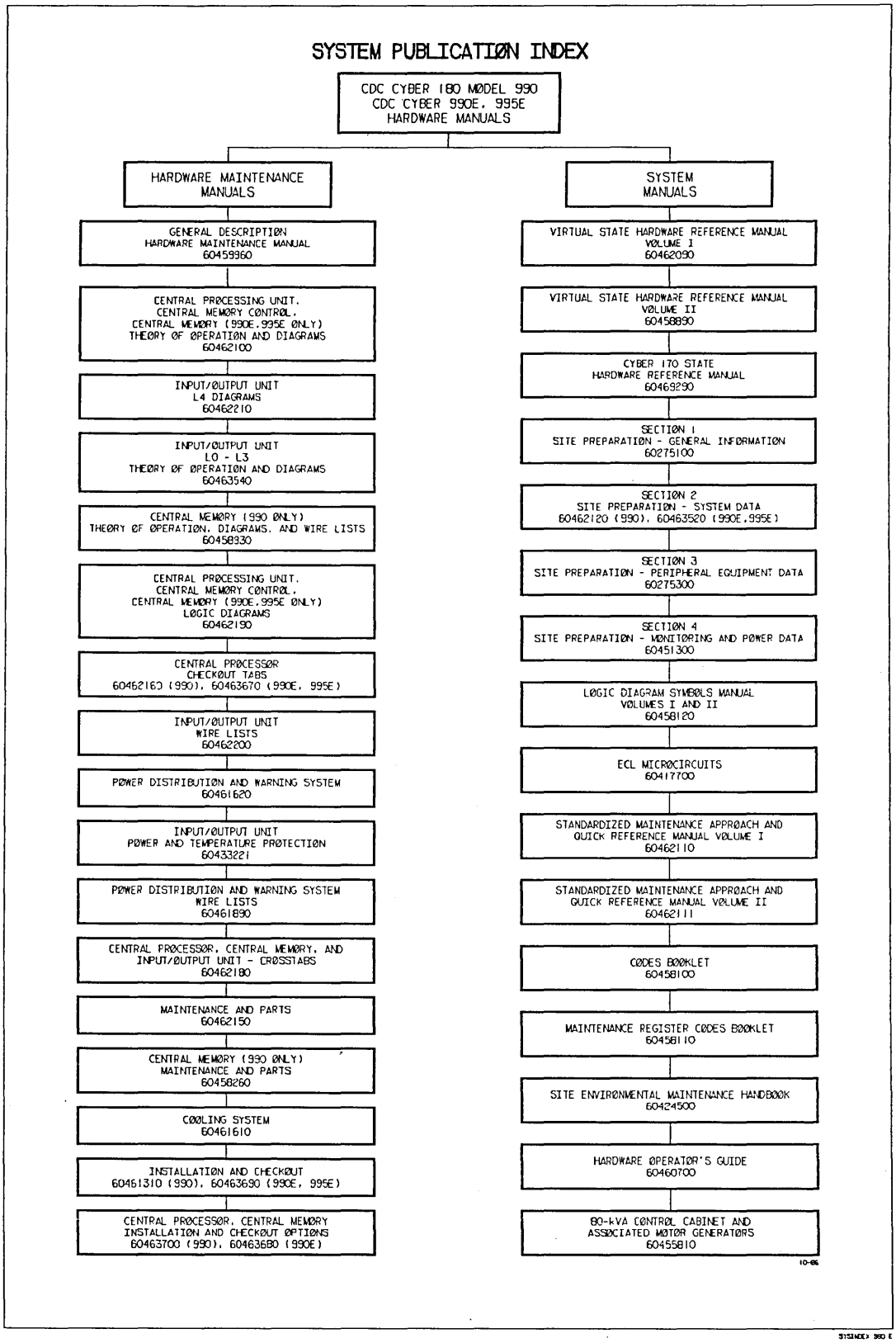
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This manual covers equipment associated with more than one computer system. The following overview of system configuration and brief description of each equipment unit are provided to aid in use of this manual.

BASIC SYSTEM CONFIGURATION

A power system for the CYBER 180 Models 840, 850, 860, 990; CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E; and CYBERPLUS computer systems consist of a system power monitor (SPM)† and the power subsystems associated with processor, memory, IOU (input/output unit), DMA†† (direct memory access) and associated units. Table 1-1 relates each system to its associated units. Figures 1-1, 1-2, 1-3, 1-3.1, and 1-4 show the system configurations.

Table 1-1. Relationship of Machines to Processor, Memory, IOU, DMA, and Associated Units

System	Processor	Memory	IOU	DMA
840, 850, 860	AD112-C/AD113-A	BS213-A	AB115-A	N/A
845S, 855S, 840A, 850A, 860A	AD112-C/AD113-A	BS213-A	AT478-A	AT481-A
990	AD115-A/AD116-A	BS174-A/ BS175-A/ BS176-A	AT478-A	AT481-A
990E	AD115-B	BS218-A/ BS219-A	AT478-A	AT481-A
995E	AD115-B/AD116-B	BS218-A/ BS219-A	AT478-A	AT481-A
CYBERPLUS	AD118-A†	N/A	N/A	N/A

†CYBERPLUS can have an optional AE243-A floating point unit.

†For CYBERPLUS systems, the SPM is given an equipment number of GK418-A.
††Not used on CYBERPLUS.

The equipment units have four different types of power supplies:

- AD112-C, AD113-A, AD115-A, AD115-B, AD116-A, AD116-B, AD118-A processors and the AE243-A floating point unit use LSI and ZIF columns and have similar power subsystems.
- AB115-A IOU has a unique power subsystem.
- BS174-A and BS175-A memories have a similar power subsystem.
- BS213-A memory, AT478-A IOU, and the AT481-A DMA have similar power subsystems.

A power system requires from one to four motor generators (MGs) to supply 400-Hz power and up to three water cooling units (WCUs). The AB115-A IOU uses a condensing unit for cooling. Site preparation manuals listed in the preface provide additional information on system configuration.

The system power monitor (SPM) controls power to the unit power subsystems, MGs, water cooling units, and peripherals. This manual describes the LSI and ZIF columns, AB115-A and BS174-A/BS175-A/BS176-A as well as the water cooling units. The Power and Temperature-Protect Systems manual listed in the preface describes the AT478-A, AT481-A, BS213-A, BS218-A, and BS219-A.

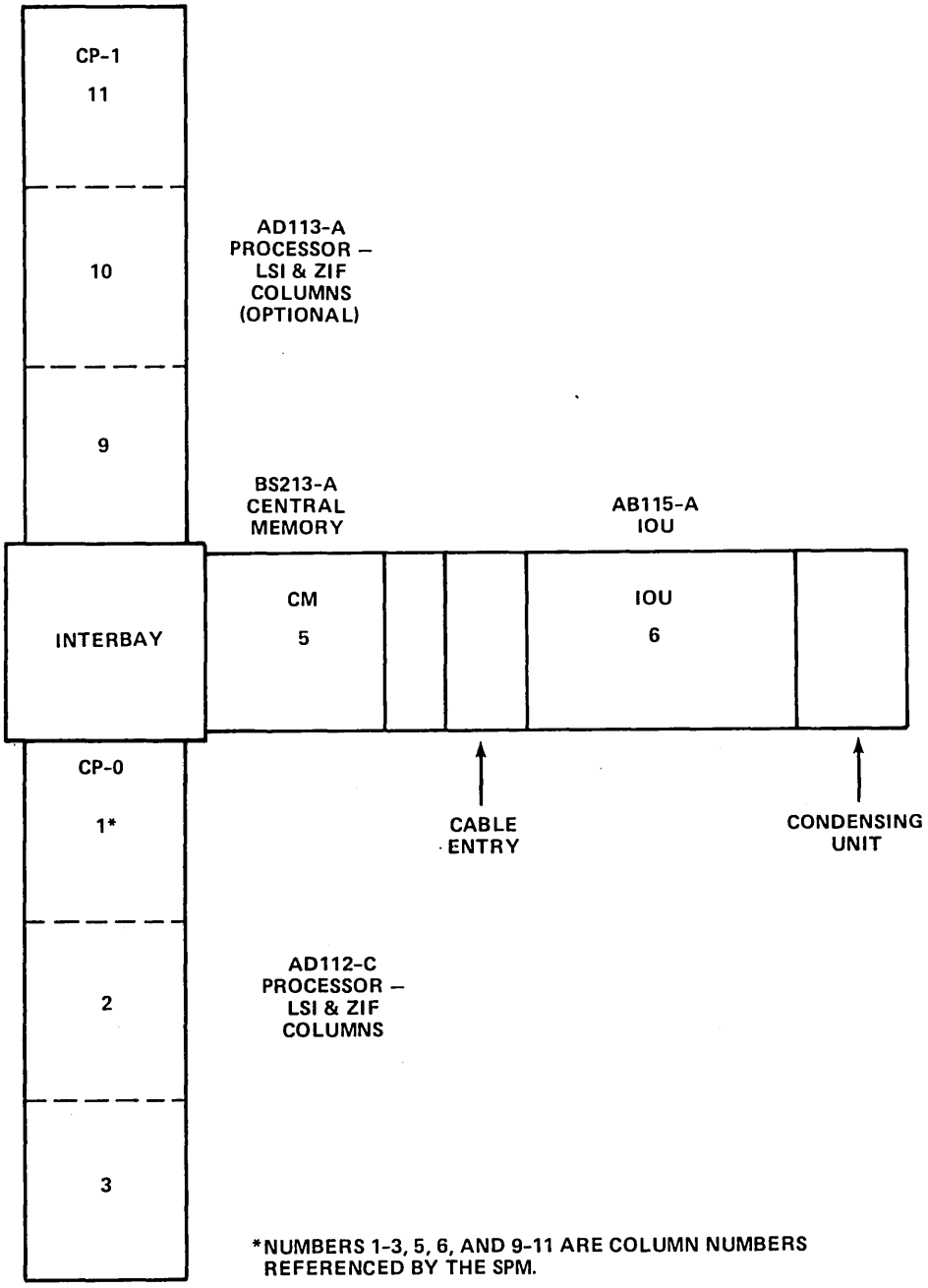


Figure 1-1. CYBER 180 Models 840, 850, 860 Configuration

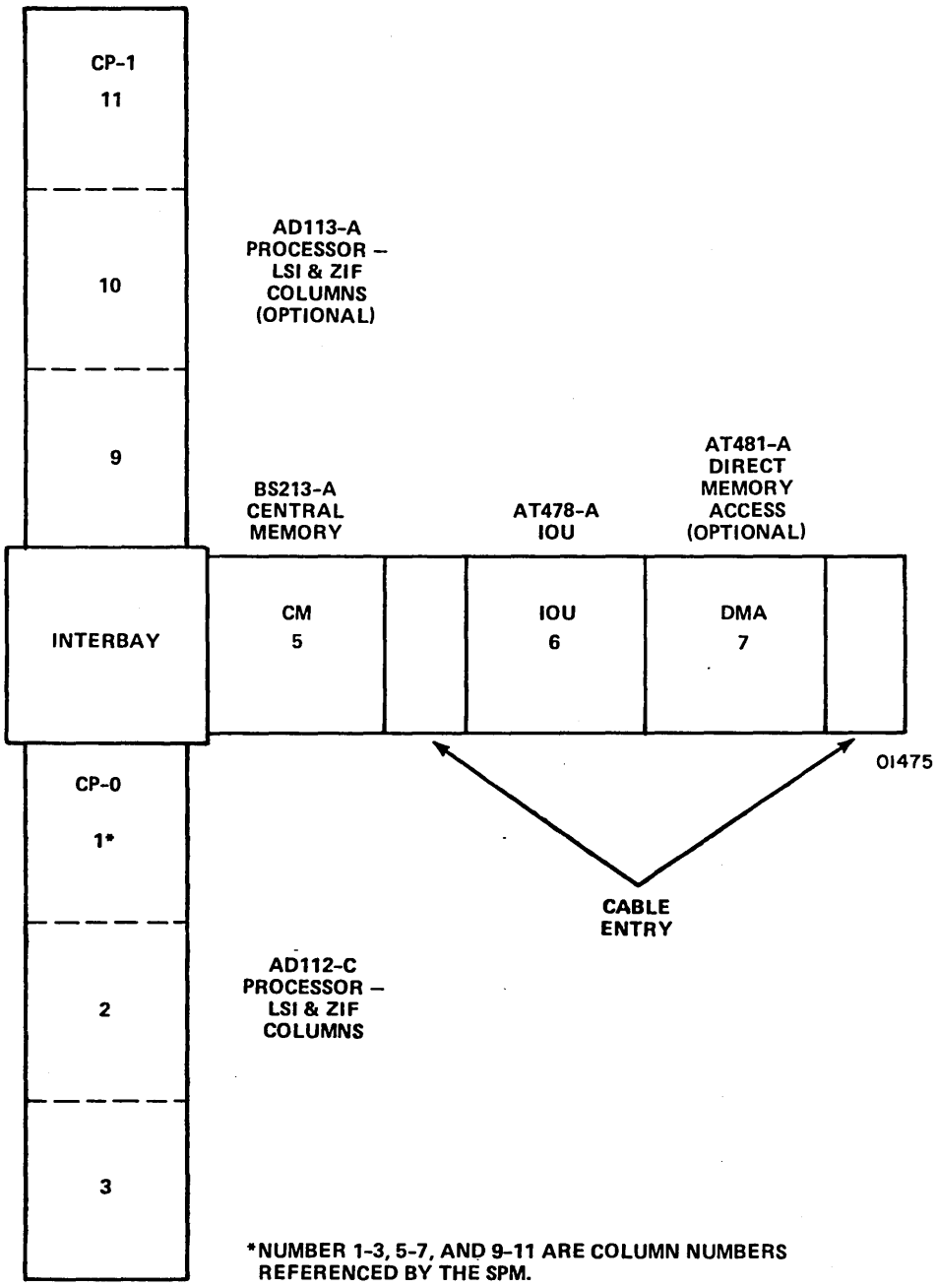


Figure 1-2. CYBER 845S, 855S, 840A, 850A, 860A Configuration

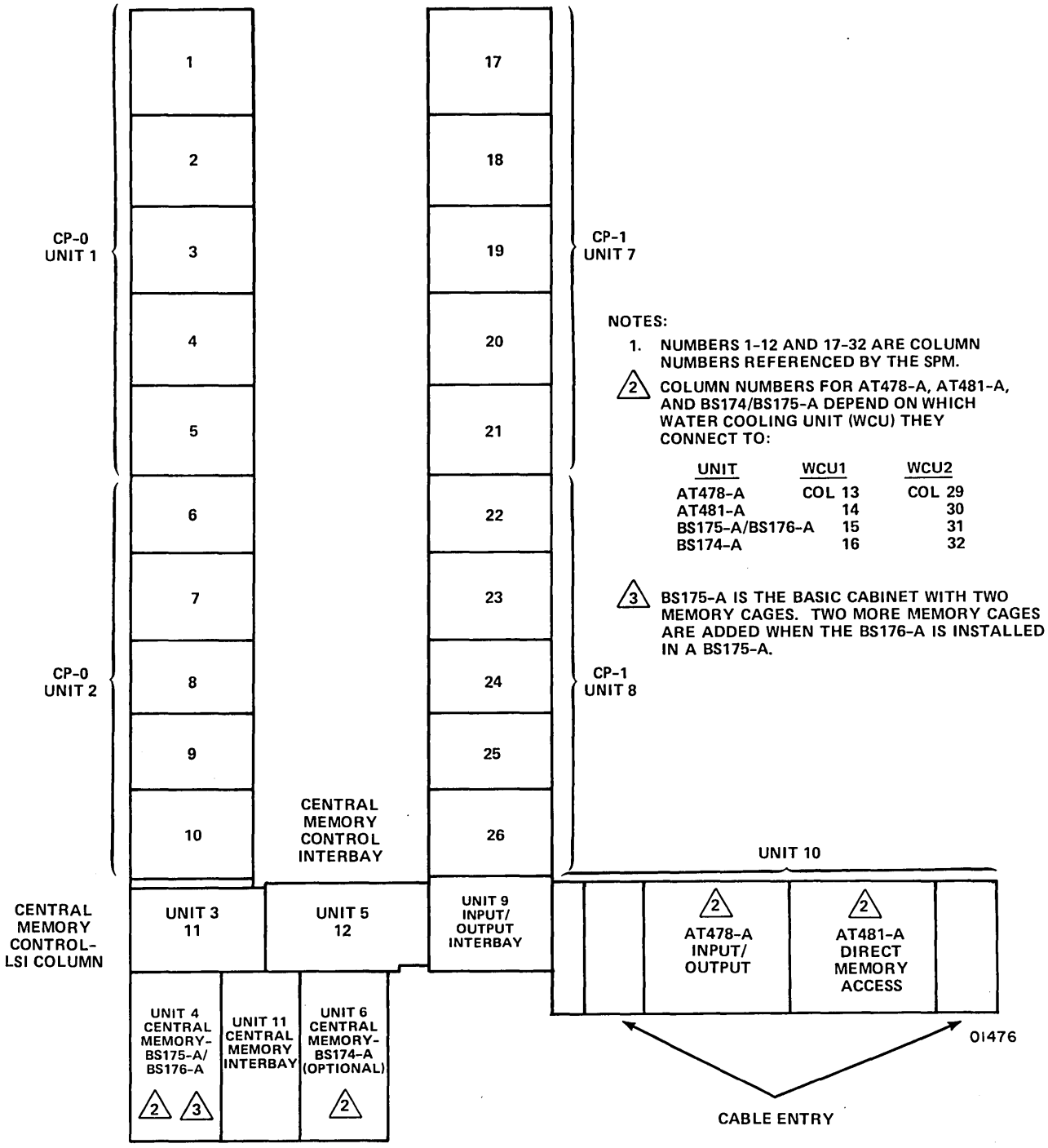
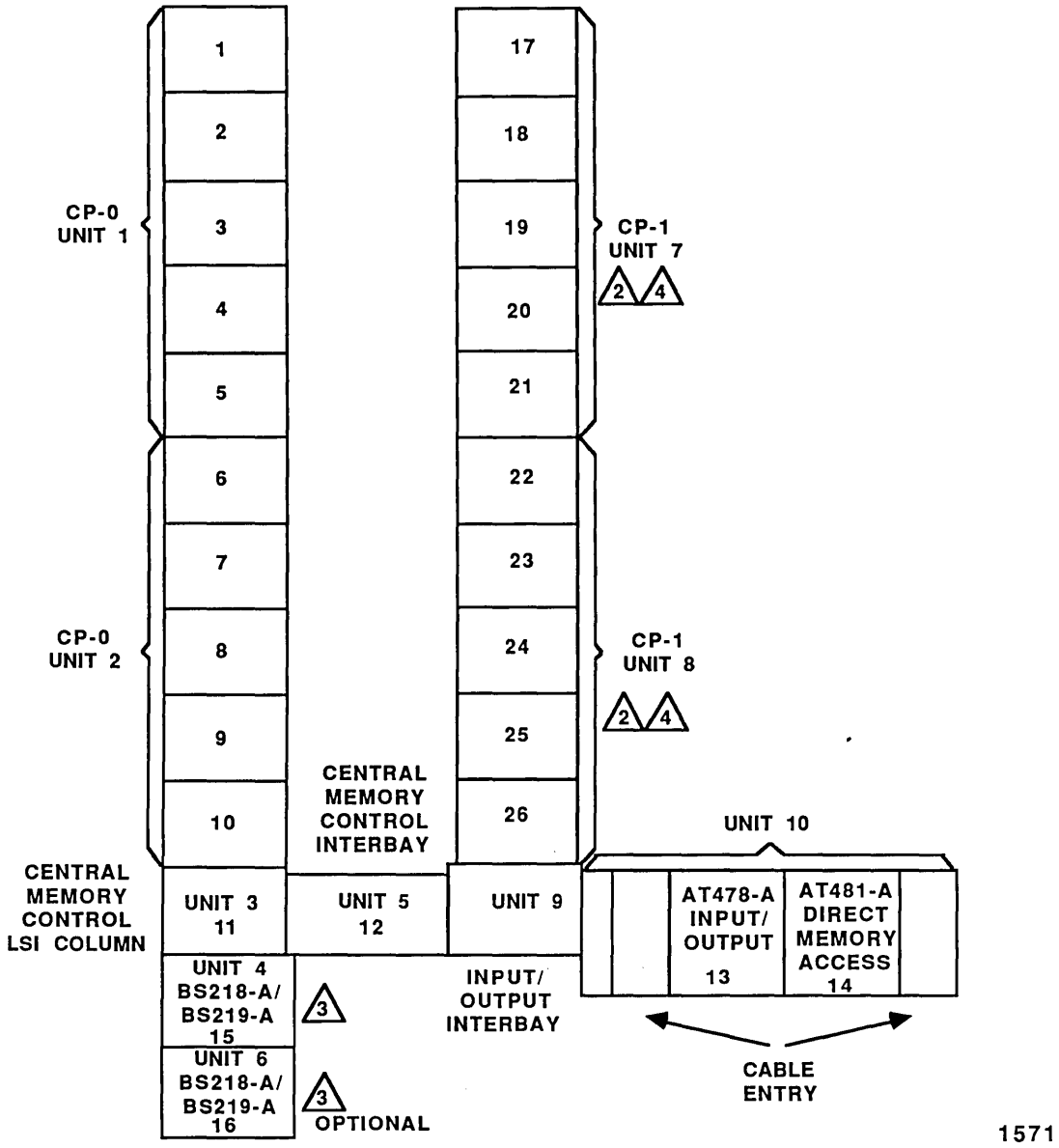


Figure 1-3. CYBER 180 Model 990 Configuration



NOTES:

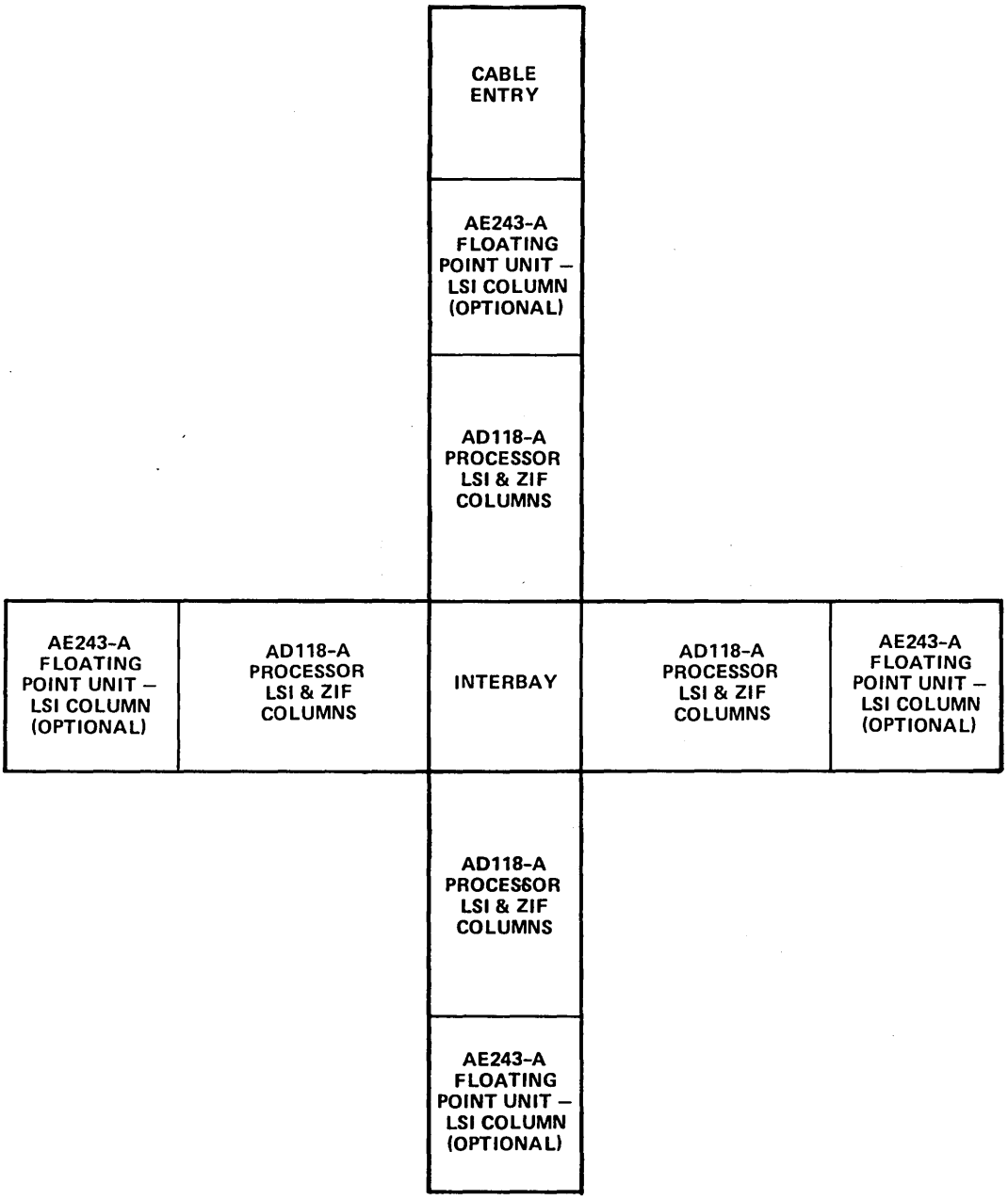
1. NUMBERS 1-26 ARE COLUMN NUMBERS REFERENCED BY SPM.

2 OPTIONAL ON CYBER 990E.

3 BS218-A IS A BASIC MEMORY CABINET. BS219-A IS A 2M WORD INCREMENT. UP TO FOUR BS219-As CAN BE INSTALLED IN A BS218-A.

4 ADDING A SECOND PROCESSOR (CP-1) TO A CYBER 990E, ALSO REQUIRES THE ADDITION OF A SECOND GH252-A WATER COOLING UNIT.

Figure 1-3.1. CYBER 990E and 995E Configuration



NOTES:

1. CYBERPLUS SYSTEMS CAN HAVE FROM 1 TO 16 PROCESSORS.
2. COLUMN NUMBERS REFERENCED BY THE SPM DEPEND ON SYSTEM CONFIGURATION. REFER TO INSTALLATION AND CHECKOUT MANUAL LISTED IN PREFACE.

Figure 1-4. Example of a CYBERPLUS Configuration

SPM AND LSI AND ZIF COLUMN DESCRIPTIONS

The following information includes the physical and functional descriptions for the SPM, LSI and ZIF columns, the GH251-A, GH251-C, and GH252-A water cooling units, the AB115-A IOU, and the BS174-A and BS175-A central memory.

SPM Physical Description

The SPM (figure 1-5) is a wall-mounted box which contains a display and controls. The SPM display indicates:

- Room and system power-off/on.
- Chiller, MG, and column fault/power-on.
- Environmental temperature, relative humidity, and dewpoint faults.
- Chiller, MG, environmental, and logic power supply status (digital display).
- Time meter.
- Local horn.

The SPM controls include:

- Start/stop, display, horn disable, and system disconnect switches.
- Two push-button circuit breakers.
- Four M-G voltage adjust potentiometers.

An outlet supplies 120-V ac, 50/60-Hz that powers an optional temperature/humidity recorder.

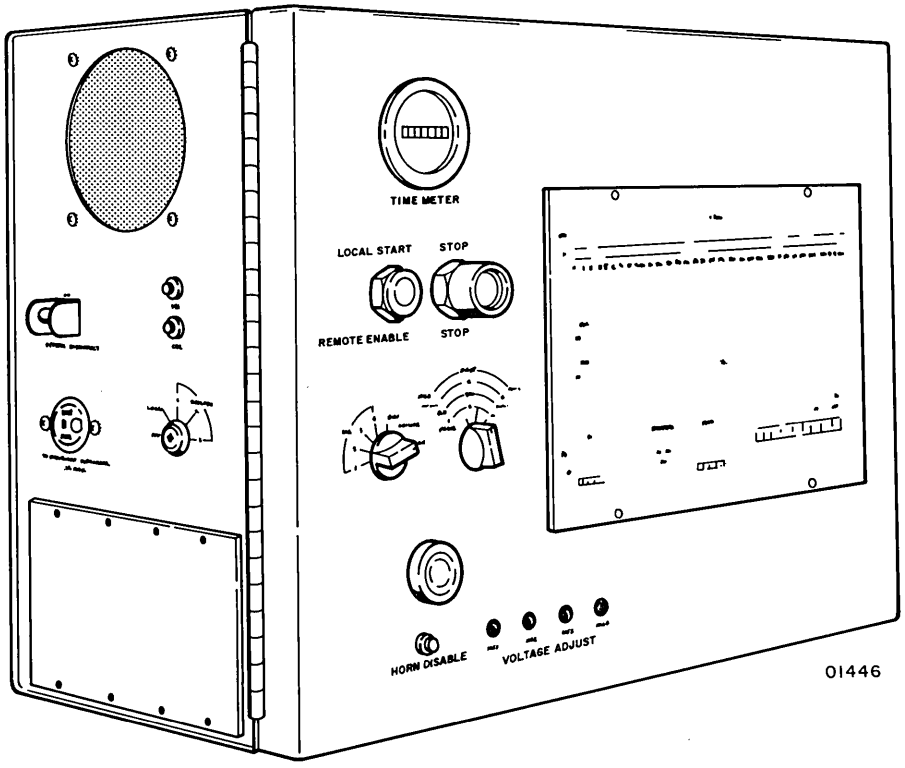


Figure 1-5. System Power Monitor

LSI and ZIF Column Physical Descriptions

The LSI and ZIF column power components (figure 1-6) consist of a power distribution box, ac to dc converters, and temperature-protect and regulator boards (if used). Each LSI logic panel has a related temperature-protect board and regulator board. A ZIF logic panel has only a related temperature-protect board. Two ac to dc converters provide unregulated -4.7 V dc and unregulated -2.7 V dc (LSI) or unregulated -2.2 V dc (ZIF). In an LSI column, the regulator boards provide -2.2 V dc. The temperature-protect boards have indicators for primary or back-up temperature faults, and the regulator boards have indicators for voltage or current faults. The power distribution box contains circuit breakers, relays, and control and protect circuits.

Column power controls are on the front panel of the power distribution box and include:

- 400-Hz, -4.7 V, and -2.2 V disconnect circuit breakers and a housekeeping (internal circuit) power circuit breaker.
- Two variable transformers which control the -4.7 V and -2.7 V/2.2-V outputs.
- Switches for local (maintenance) or remote power-up, reset, and testing of certain fault indicators.
- Test points for monitoring input and output cooling water temperature.

The top of the power distribution box has indicators for column, water cooling unit, and cable faults. The power distribution box slides out of the column for access.

Functional Description

Figure 1-7 is a block diagram of the power system for an LSI or ZIF logic column. The SPM powers-up the system, monitors system status, and performs warning and alarm functions, if enabled. Internal switches enable or disable the alarm functions. System power application can occur via a local manual start function or via a remote manual start function at a master SPM. Any SPM can function as a master or slave SPM if properly connected. When a start function occurs, the SPM automatically applies power to the water cooling units, MGs, columns, and peripherals. After a start function, the water cooling units, MGs, and chassis columns return signals indicating that they are or are not powered-on. The SPM display shows where a fault exists when power application is not successful.

After power application, the SPM sequentially monitors water cooling unit status, M-G status, and column power status. Conditions monitored for each column are whether the column is in use, power supply outputs, and warning status. If a fault is detected, the SPM:

- Sends a warning to the central processing unit (CPU).
- Indicates the fault on the display.
- Activates the local alarm (if enabled) and the remote alarm (if present and enabled).

Some faults cause the SPM to remove system power. Each column has circuitry which monitors internal temperature and power supply conditions. Upon detection of a fault, a warning goes to the SPM, and the column powers-down when required. Unit emergency-off capability is provided by a cabinet-mounted, externally accessible switch.

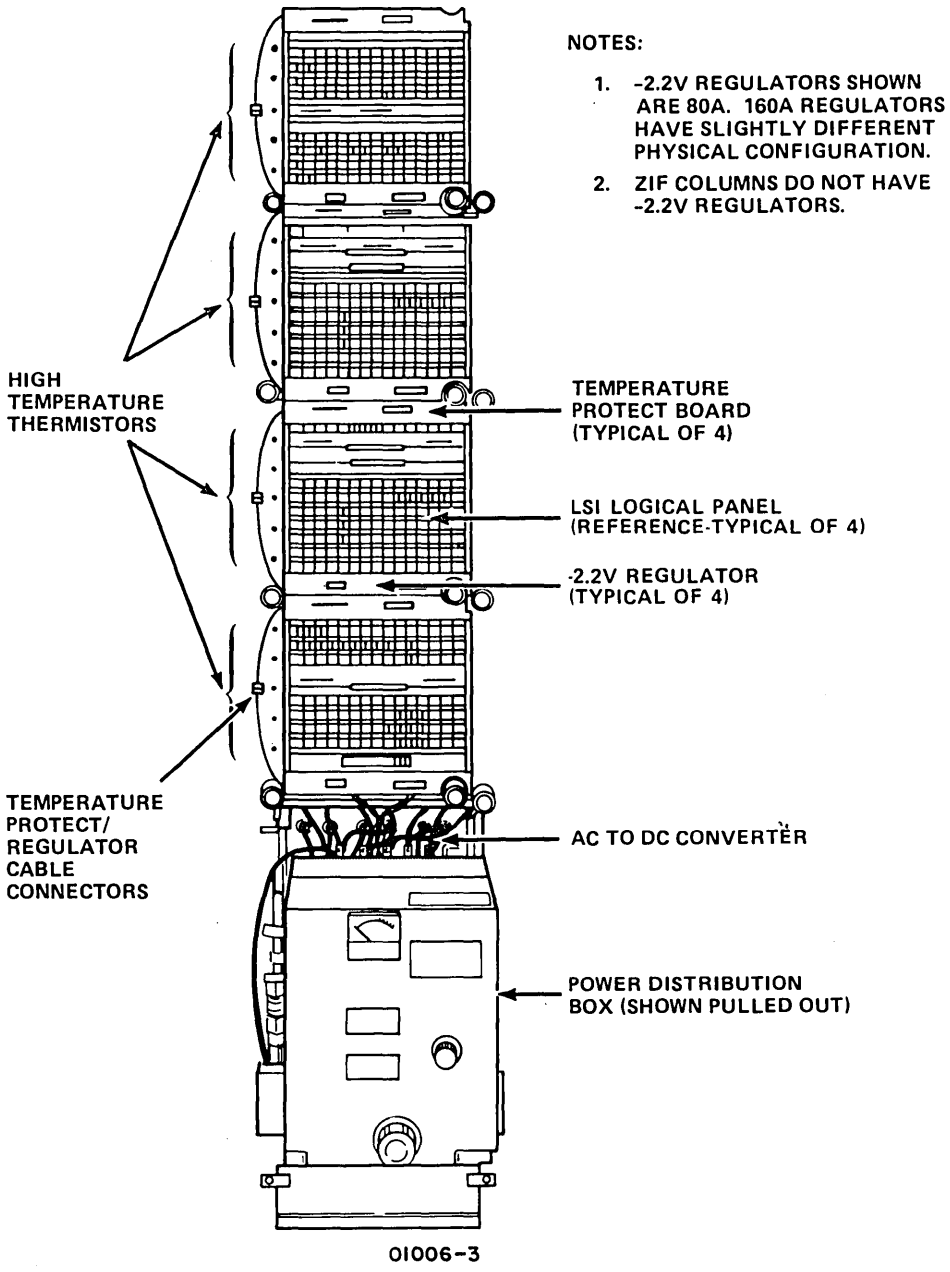


Figure 1-6. Column Power Components

GH251-A AND GH251-C WATER COOLING UNIT DESCRIPTION

An integral 50/60-Hz power disconnect box distributes 50/60-Hz power to the water cooling unit components. It monitors status and reacts to fault conditions by sending a fault signal to the SPM. The 50/60-Hz power disconnect box also displays cooling unit faults.

GH252-A WATER COOLING UNIT DESCRIPTION

An integral 50/60-Hz power disconnect box distributes 50/60-Hz power to the water cooling unit pump and control/protect circuits. The unit monitors status and sends a warning signal to the SPM when a fault occurs. It also displays cooling faults on an indicator panel.

AB115-A IOU DESCRIPTION

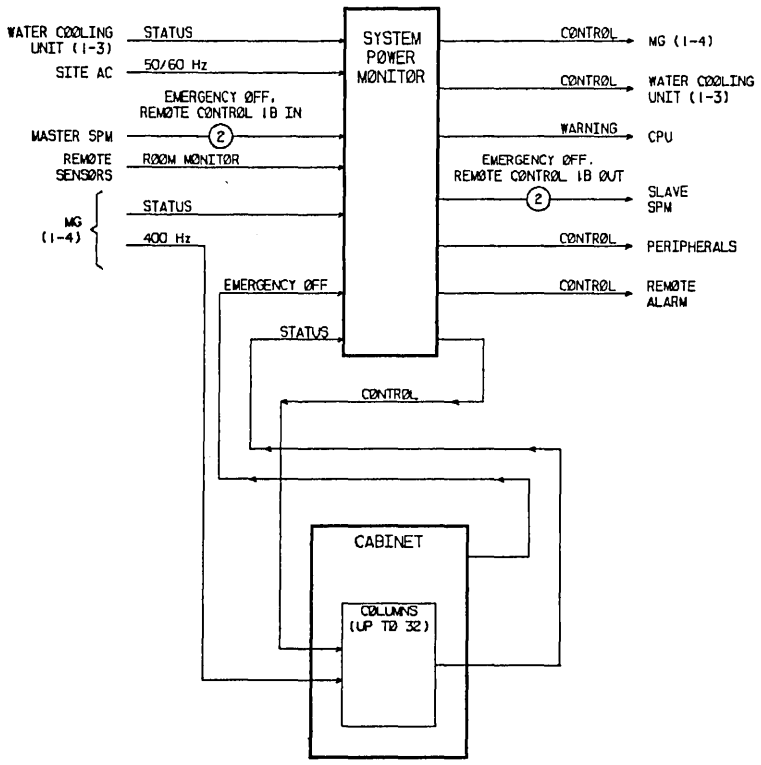
The AB115-A contains a 50/60-Hz power control box (PCB) and a 400-Hz PCB (figure 1-8). The 50/60-Hz PCB controls 50/60-Hz and 400-Hz power, and displays faults. 50/60-Hz power goes to the condensing unit and cooling fans. 400-Hz power goes to the 400-Hz PCB. Faults displayed are related to the cabinet temperature, blowers, and condensing unit. Any of these faults removes 50/60-Hz and 400-Hz power. A smoke fault displayed in the mainframe cabinet also removes 50/60-Hz and 400-Hz power. The 400-Hz PCB contains variable auto transformers which adjust the 400-Hz input. The variable autotransformers connect to chassis-mounted power supplies. These supplies provide -5.2 V, +5.0 V, -2.2 V, and $\pm$12 V logic power.

AB115-A Faults

Three temperature sensors detect high temperature warning and shutdown levels; one cabinet sensor detects low temperature (possible condensation) condition.

If cabinet temperature reaches 35 $\pm$ 2.2 °C (95 $\pm$ 4 °F) and the CONTROL switch on the 50/60-Hz PCB is set to REMOTE, that cabinet receives a Long Warning status signal (status bit 63). This signal indicates that a high temperature warning sensor has detected an overheated diode heat sink. The overheating results from insufficient refrigerant flow which can be caused by a condition such as a bad expansion valve, an incorrect superheat setting, or an undercharge of refrigerant. Refer to the cooling system manual listed in the preface for troubleshooting information.

If cabinet temperature reaches 48.9 $\pm$ 2.2 °C (120 $\pm$ 4 °F), the HIGH TEMP FAULT indicator lights on the cabinet's 50/60-Hz PCB. After 2.5 seconds, the 400-Hz power line within the cabinet opens, the cabinet blowers stop to prevent further heat build-up from the blower motors, and the condensing unit pumps down and stops. If the CONTROL switch on the 50/60-Hz PCB is set to REMOTE, the processor receives a Short Warning status signal.



NOTE

I2
AB115-A IOU does not connect to the SPM protection system.

Figure 1-7. Block Diagram of the Power System

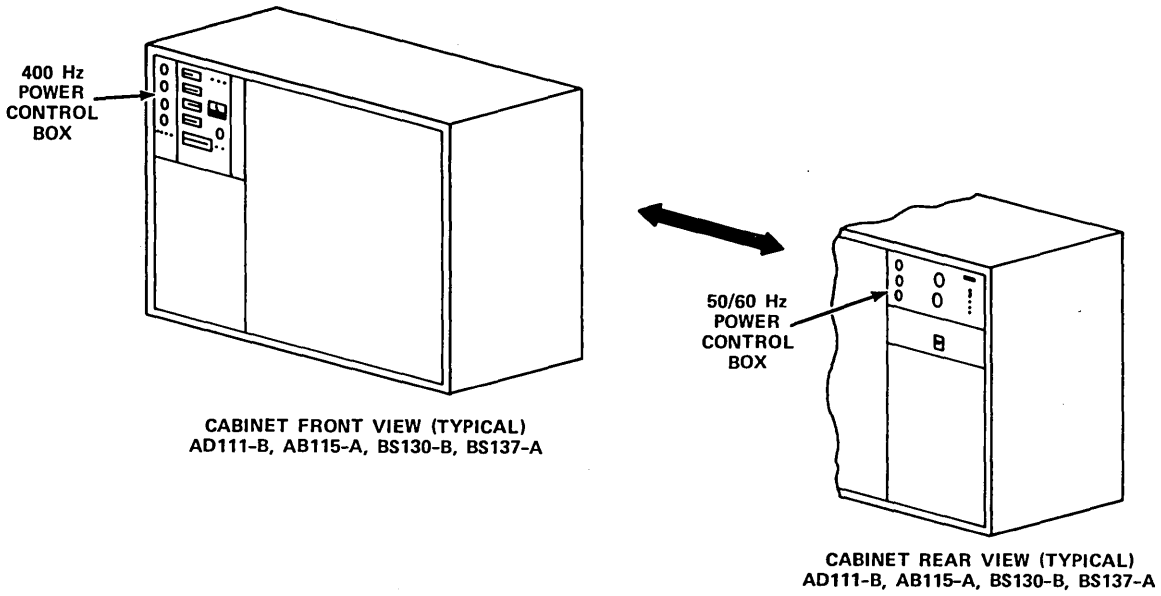


Figure 1-8. AB115-A 50/60-Hz and 400-Hz PCBs

If cabinet temperature reaches 54.4 ± 2 °C (130 ± 4 °F), the logic power supply circuit breakers on the 400-Hz PCB open, opening the 400-Hz DISCONNECT circuit breaker. This is a back-up condition and will occur only if the primary temperature protection fails.

If cabinet temperature reaches 13.9 ± 1 °C (57 ± 2 °F), a danger of condensation exists and the LOW TEMP FAULT on the 50/60-Hz PCB lights. Approximately two minutes later, the 400-Hz line within the cabinet opens, the cabinet blowers stop, and the condensing unit pumps down and stops. If the CONTROL switch on the 50/60-Hz PCB is set to REMOTE, the cabinet logic receives a Long Warning status signal.

Failure of either cabinet blower lights the appropriate BLOWER FAULT indicator on the 50/60-Hz PCB; high condensing unit head pressure lights the COND UNIT FAULT indicator. Approximately 2.5 seconds after either fault, the 400-Hz power line within the cabinet opens, and the condensing unit pumps down and stops.

If any of the four smoke detectors connected in series in a cabinet activates, light-emitting diodes (LEDs) light and all logic power supply circuit breakers and the 400-Hz DISCONNECT circuit breaker on the 400-Hz PCB open.

NOTE

The AB115 IOU does not connect to the SPM protection system.

BS174-A/BS175-A CENTRAL MEMORY DESCRIPTION

BS174-A/BS175-A power components consist of a power control assembly, a 400-Hz power control box (PCB), temperature, current, and voltage protection assembly (TCVP) for each memory cage, and a -2.2 V adjust panel. The basic BS175-A contains only two memory cages. Two additional memory cages are added if a BS176-A is installed in a BS175-A. The BS174-A option contains four memory cages.

The power control assembly consists of the power control indicator and the power control module assembly. The power control indicator provides the switches, fault indicator LEDs, and test jacks required to provide control and display status provided by the power control module assembly functions. The power control module assembly monitors system status and provides control signals required to remove cabinet power.

The 400-Hz PCB serves as the input power wiring junction box. It contains the main cabinet 400-Hz circuit breaker and provides -2.2 V power supply circuit breaker protection and control, as well as a meter for observing the -2.2 V power level.

Each slide-in type TCVP assembly monitors one memory cage for high temperature conditions and, in conjunction with the power control assembly, provides overvoltage/overcurrent protection. Each TCVP assembly also displays the high temperature and overvoltage/overcurrent conditions.

Each memory cage has a 4.7 V power control, power supply circuit breaker protection, and a meter for observing the power level.

This section contains system power/fault control and indicator descriptions and power application/removal procedures.

CONTROLS AND INDICATORS

The following equipment contains power controls and indicators:

- SPM
- Column related components
- Water cooling units
- IOU
- Central memory

SPM Controls and Indicators

Figures 2-1 and 2-2 show the SPM side panel, front panel controls and indicators. Tables 2-1 and 2-2 describe them.

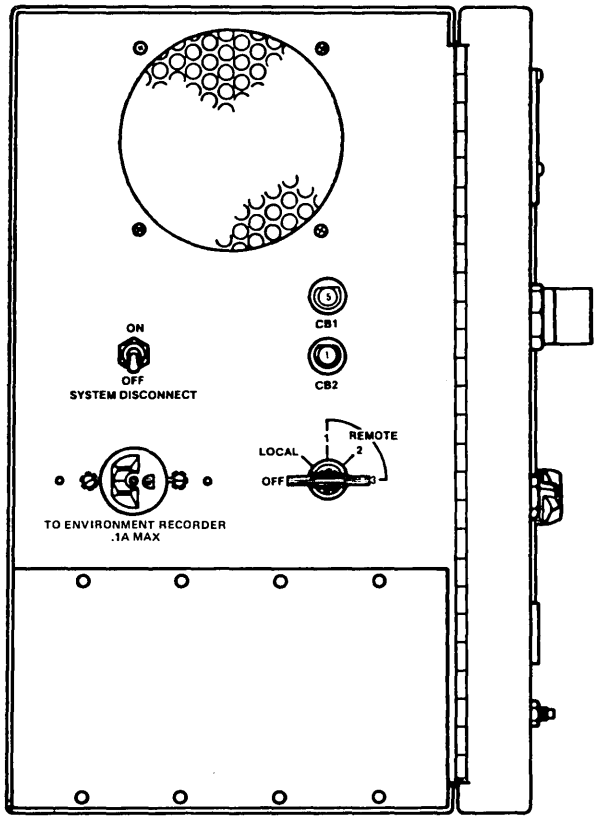


Figure 2-1. SPM Side Panel Controls

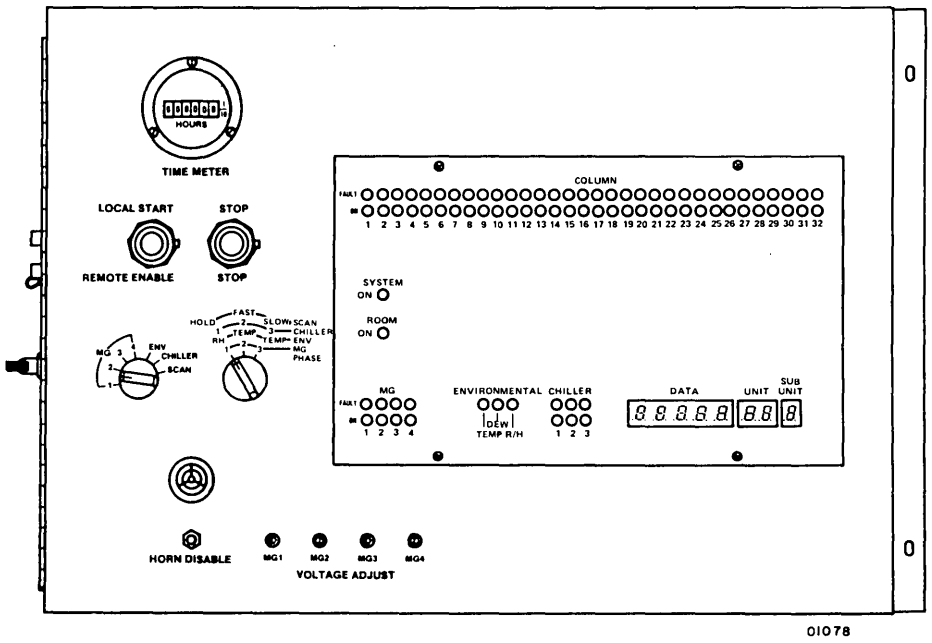
SPM Fault Alarm System

The SPM has an alarm system consisting of fault indicators, a local (panel-mounted) alarm, and capability to activate an optional remote audio or visual alarm. Certain faults can cause power removal. The alarm system is enabled/disabled for certain faults by internal switches. Refer to SPM Configuration in section 5, Diagrams, for additional information. The AB115-A IOU does not connect to the SPM alarm system.

Table 2-1. SPM Side Panel Controls

Panel Nomenclature	Description	Function
SYSTEM DISCONNECT	Toggle Switch	Removes 50/60-Hz power from SPM during maintenance.
TO ENVIRONMENT RECORDER †	Power Outlet	Supplies 50/60-Hz power optional AU116-A temperature and humidity recorder (.1A max).
CB1	Push-button Circuit Breaker	Interrupts 50/60-Hz power to SPM upon overload.
CB2	Push-button Circuit Breaker	Interrupts SPM housekeeping power upon overload.
OFF, LOCAL, REMOTE	Key Switch	Selects control point for application of 50/60-Hz and 400-Hz power to system (independent/master/slave operation): OFF — Power cannot be applied. LOCAL — Power controlled by LOCAL/START REMOTE/ENABLE switch on SPM (independent/master operation). REMOTE 1 — SPM functions as a slave and is controlled by 120-V ac or by contact closure from a master SPM. REMOTE 2 — SPM functions as a slave and is controlled by 24-V dc from a master SPM. (SW/Start daisy chain also required. REMOTE 3 — Not currently used.

† Use this outlet to power the AU116-A temperature and humidity recorder only.



NOTE

Refer to Basic System Configuration in Section 1 for relationship of Column Fault/ON indicators to columns.

Figure 2-2. SPM Front Panel Controls and Indicators

Table 2-2. SPM Front Panel Controls and Indicators (Sheet 1 of 3)

Panel Nomenclature	Description	Function
TIME METER	Digital Meter	Indicates how long SPM has been powered-on.
LOCAL START, REMOTE ENABLE	Push-button Switch	With key switch set to LOCAL, unlatches STOP switch and applies power to equipment controlled by SPM. With key switch set to REMOTE 1 or REMOTE 2, SPM is under control of master SPM, and LOCAL START/REMOTE ENABLE switch is not used.
STOP	Push-button Switch	Removes power from SPM and all equipment controlled by SPM.
COLUMN FAULT, ON (1-32)	Indicator	ON light indicates related column power is on. FAULT light indicates an inter-fault in related column.†
SYSTEM ON	Indicator	Lights when a successful local or remote start function has occurred.
ROOM ON	Indicator	Lights when 50/60-Hz power is present at input of SPM, SYSTEM DISCONNECT switch is on, and LOCAL START/REMOTE ENABLE switch is pressed. Indicates SPM is ready for remote control.
M-G FAULT, ON (1-4)	Indicator	ON light indicates related M-G output is over 75 V. FAULT light indicates M-G FAULT.††

† The COLUMN FAULT lights have one or both of the following functions:
1. Indicates a fault in the related column. Refer to the column to determine which fault. The local horn sounds and Long Warning occurs. If SN1-7 is on, the remote alarm activates. If SN1-8 is on, the remote alarm activates if any column does not have power applied.
2. If SN1-5 is on, indicates a related column logic power supply voltage is less than 90% or greater than 110% of nominal. Local horn sounds and Long Warning occurs.

†† The M-G FAULT lights have one or both of the following functions:
1. Indicates loss of power to related M-G motor. The local horn sounds and Short Warning occurs. If SN1-7 is on, the remote alarm activates.
2. If SN1-1 is on, indicates the voltage of any phase is less than 96-V or greater than 144-V. Local horn sounds and Long Warning occurs.

Table 2-2. SPM Front Panel Controls and Indicators (Sheet 2 of 3)

Panel Nomenclature	Description	Function
ENVIRONMENTAL TEMP, TEMP, RH	Indicator	These lights indicate room temperature, dewpoint (disabled on CYBERPLUS), and relative humidity faults.† ††
CHILLER FAULT, ON (1-3)	Indicator	ON indicates related chiller (WCU) has power applied. FAULT indicates a problem with the related chiller.†††

†The TEMP, DEW, and RH lights indicate environmental conditions are not within the following ranges (if internal SN1-2,3,4 are on):

Room Temperature
12 °C to 32 °C (54 °F to 90 °F)
Dewpoint (when used) is
-18 °C to 13 °C (0 °F to 56 °F)
-18 °C to 14 °C (0 °F to 58 °F)
Relative Humidity 20%-70%

The local horn sounds and Long Warning occurs.
If SN3-3,4,5 are on and the following limits are reached, the local horn activates, the remote alarm activates and Short Warning occurs:

Room Temperature	40 °C (104 °F)
Dewpoint (When Used)	14 °C (58 °F)
Relative Humidity	96%

If SN3-6 is on, system power is removed.

††If an external dewpoint sensor is present and SN3-1 is on, the TEMP, DEW, and RH indicators all light, the local and remote alarms activate, and Long Warning occurs when dew is sensed.
If an external sensor is present and SN3-2 is on, the TEMP, DEW, and RH indicators all light, the local and remote alarms activate, and Short Warning occurs when dew is sensed. If SN3-6 is on, system power is removed.

†††The Chiller Fault lights have one or both of the following functions:

1. Indicates related chiller is not on or has a high pressure, low temperature, or high/low level fault. Refer to chiller to determine which fault. Local horn sounds and Long Warning occurs.
2. If SN1-6 is on, indicates related chiller water temperature is below 0 °C (32 °F) or above 27 °C (80 °F). The local horn sounds and Long Warning occurs.

Table 2-2. SPM Front Panel Controls and Indicators (Sheet 3 of 3)

Panel Nomenclature	Description	Function
DATA	5-Digit Display	Displays M-G voltage, environmental RH, temperature, chiller (WCU) water temperature, or logic power supply voltage depending on setting of MG/ENV/CHILLER/SCAN and SCAN/CHILLER ENV/MG PHASE switches.†
UNIT	2-Digit Display	Displays MG, chiller (WCU), or column numbers and designators for environmental temperature, and RH.†
SUB-UNIT	1-Digit Display	Displays M-G phase or logic power supply number.†
MG, ENV, CHILLER, SCAN	Rotary Switch	Selects M-G 1-4, environment, chiller (WCU), or scan.††
SCAN, CHILLER, ENV, MG PHASE	Rotary Switch	Selects one of the following for digital display: • Scan rate.†† • Chiller 1, 2, or 3 water temperature • Environmental RH or temperature • M-G voltage (phase 1, 2, or 3).
HORN DISABLE	Push-button Switch	Disables local horn. If same fault recurs or a new fault occurs, horn sounds again.
MG1, MG2, MG3, MG4	Potentiometers	Adjust the related M-G output by ±5%.

†Refer to Digital Display Relationship in following text.
††When set to fast or slow scan, the digital display continuously polls all units under SPM control that have power applied and are not set for local power control.

SPM Digital Display Relationship

When SUB-UNIT shows the power supply number, then UNIT shows the column number, DATA reads dc voltage, and so on as shown in table 2-3.

Table 2-3. Digital Display Relationship

DATA	UNIT	SUB-UNIT
DC Volts (Logic Pwr Sply)	1-32 (Column No.)	1-7 (Pwr Sply No.)
AC Volts	G1-G4 (M-G No.)	1-3 (M-G Phase)
Temp ^{o}F (Out Manf)	C1-C3 (Chiller No.)	
Temp ^{o}F (Envir)	F	
% Rel Hum (Envir)	H	
Dewpt Temp ^{o}F (Envir)	d	

LSI and ZIF Column Controls and Indicators

Column related controls and indicators are on the power distribution (PD) box. Indicators are on the temperature-protect boards and on the -2.2 V regulator boards (if present). †

LSI and ZIF Column Power Distribution Box Controls and Indicators

Figure 2-3 shows the power distribution (PD) box front panel and top controls and indicators. Tables 2-4 and 2-5 describe them.

† ZIF columns do not have -2.2 V regulator boards.

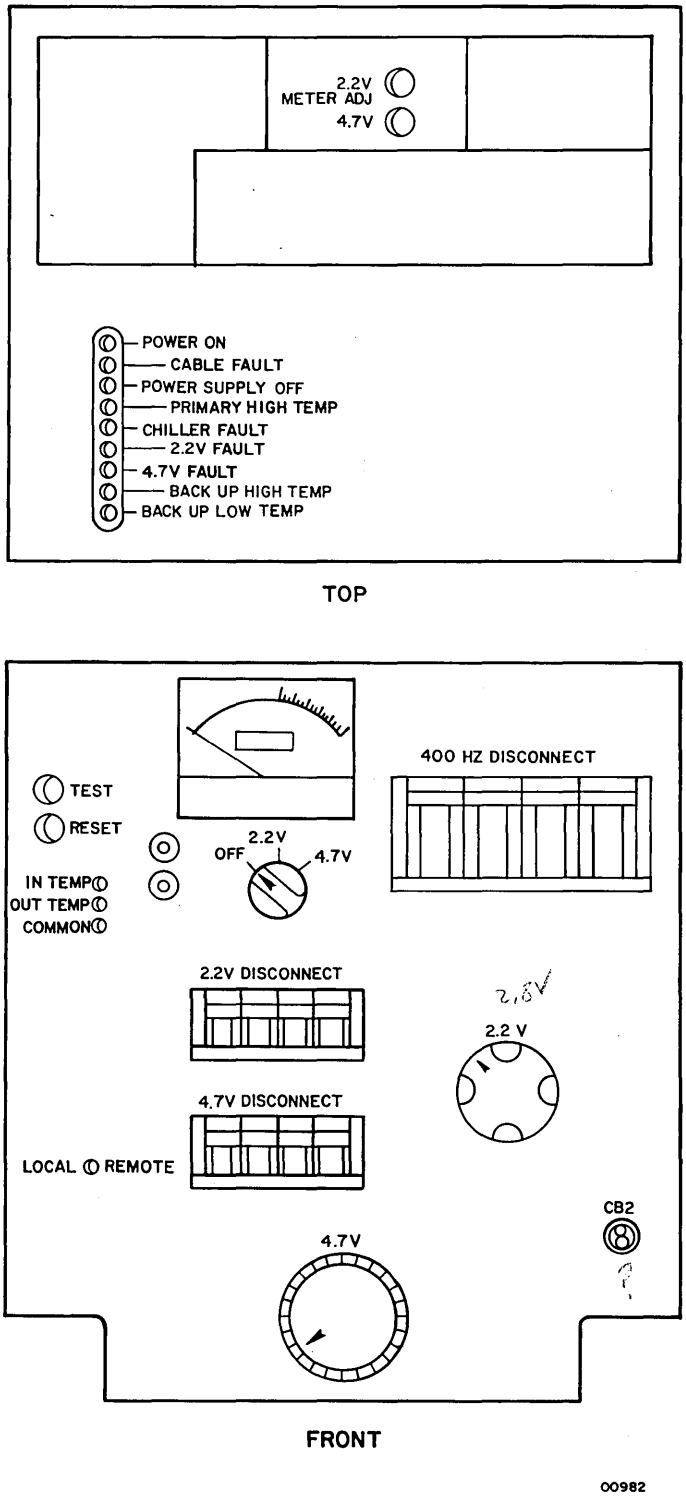


Figure 2-3. LSI and ZIF Column Power Distribution Box Controls and Indicators

Table 2-4. LSI and ZIF Column PD Box Front Panel Controls and Indicators (Sheet 1 of 2)

Panel Nomenclature	Description	Function
TEST	Push-button Switch	Checks 2.2-V and 4.7 V fault circuits (except sense circuits). Causes 2.2-V and 4.7-V FAULT LEDs to light.
RESET	Push-button Switch	Clears all fault conditions PD box powers-on if no faults exist and all breakers and switches are properly set.
CB2	Push-button Circuit Breaker	Restores housekeeping power if no faults exist.
IN TEMP	Test Point	Provides an analog voltage for measurement of column input water temperature (1 mV = 1 ^{o}C).
OUT TEMP	Test Point	Provides an analog voltage for measurement of column output water temperature (1 mV = 1 ^{o}C).
	Percentage Voltmeter	Indicates logic power supply voltage within $\pm$20 %.
	Red and Blue Pin Jacks	For measurement of logic power supply voltages. Connected to same points as voltmeter.
OFF, 2.2-V, 4.7-V	Rotary Switch	Switches voltmeter and pin jacks to -2.2 V or -4.7 V logic power supply outputs.
LOCAL, REMOTE	Toggle Switch	When set to LOCAL, circuit breakers control power to PD box. In LOCAL mode, warning to SPM is inhibited, and SPM indicates column is off. When set to REMOTE, PD box powers-up via SPM.
400-HZ DISCONNECT	Circuit Breaker	Removes 400-Hz input from column -2.2 V and -4.7 V logic power supplies and housekeeping power supply.
2.2-V DISCONNECT	Circuit Breaker	Removes 400-Hz input from -2.2 V logic power supply.

Table 2-4. LSI and ZIF Column PD Box Front Panel Controls and Indicators (Sheet 2 of 2)

Panel Nomenclature	Description	Function
4.7-V DISCONNECT	Circuit Breaker	Removes 400-Hz input from -4.7 V logic power supply.
2.2-V	Variable Transformer	Provides 0 to 140% adjustment of -2.7 V power supply.
4.7-V	Variable Transformer	Provides 0 to 120% adjustment of -4.7 V logic power supply.
METER ADJ 2.2-V/4.7-V	Potentiometers	Provide the capability to calibrate the panel voltmeter for -2.2 V and -4.7 V.

Table 2-5. LSI and ZIF Column PD Box Top Indicators (Sheet 1 of 2)

Panel Nomenclature	Description	Function
POWER-ON	Indicator	Indicates that 400-Hz primary power is present and that logic power is available if variable transformers are properly set.
CABLE FAULT †	Indicator	Indicates an open in the warning cable fault loop. Removes column power immediately upon detection of fault.
POWER SUPPLY OFF †	Indicator	Indicates that 2.2-V Disconnect or 4.7-V Disconnect circuit breaker is off. Removes column power immediately upon detection of fault.
PRIMARY HIGH TEMP †	Indicator	Indicates that temperature at logic panel coolant pass exceeds 35 °C (95 °F). Removes column power 15 seconds after fault detection. Refer to column temperature-protect boards to determine which coolant pass.

† Horn sounds and column indicator lights on SPM if PD box LOCAL/REMOTE switch is set to REMOTE.

Table 2-5. LSI and ZIF Column PD Box Top Indicators (Sheet 2 of 2)

Panel Nomenclature	Description	Function
CHILLER FAULT†	Indicator	Indicates an internal chiller fault. Refer to SPM to determine which chiller (WCU), and to chiller to determine which fault.
2.2-V FAULT†	Indicator	Indicates that -2.2 V power at a logic panel exceeds 3-V or 200-A. Removes column power immediately upon fault detection.
4.7-V FAULT†	Indicator	Indicates that -4.7 V power at a logic panel exceeds 6-V or 300-A. Removes column power immediately upon fault detection.
BACK UP HIGH TEMP†	Indicator	Indicates that the temperature at a logic panel coolant pass exceeds 40 °C (104 °F). Removes column power 2.5 seconds after fault detection. Refer to column temperature-protect boards to determine which coolant pass.
BACK UP LOW TEMP†	Indicator	Indicates that dew has formed on input water line to column. Removes column power 100 seconds after fault detection.

†Horn sounds and column indicator lights on SPM if PD box LOCAL/REMOTE switch is set to REMOTE.

LSI and ZIF Column Temperature-Protect Board Indicators and Test Points

Figure 2-4 shows the temperature-protect board indicators and test points and table 2-6 describes them.

NOTE

Pass 5 is not used on ZIF columns.

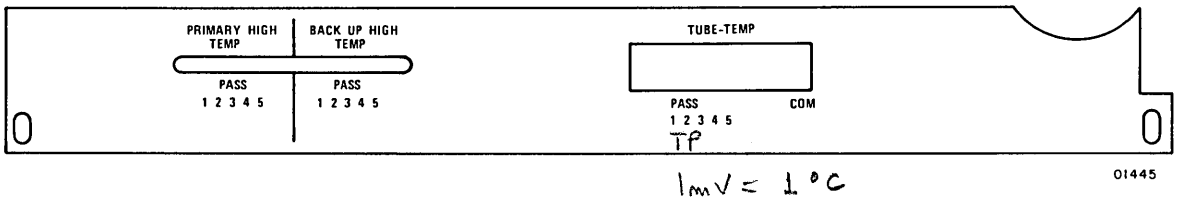


Figure 2-4. LSI and ZIF Column Temperature-Protect Board Indicators and Test Points

Table 2-6. LSI and ZIF Column Temperature-Protect Board Indicators and Test Points

Panel Nomenclature	Description	Function
PRIMARY HIGH TEMP†† PASS 1 2 3 4 5	Indicator	Indicates that temperature at logic panel coolant pass 1, 2, 3, 4, or 5†† exceeds a predetermined maximum: LSI - 35 °C (95 °F) ZIF - 38 °C (100 °F) Removes column power 15 seconds after fault detection.
BACK UP HIGH TEMP†† PASS 1 2 3 4 5	Indicator	Indicates that temperature at logic panel coolant pass 1, 2, 3, 4, or 5†† exceeds a predetermined maximum: LSI - 40 °C (104 °F) ZIF - 45 °C (117 °F) Removes column power 15 seconds after fault detection.
TUBE TEMP PASS 1 2 3 4 5	Test Points	Allow measurement of temperature at logic panel coolant pass 1, 2, 3, 4, or 5† (1 mV = 1 °C).

†Primary and back-up temp faults cause a fault indication on the PD box.
††Pass 5 is not used on ZIF columns.

LSI and ZIF Column -2.2 V Regulator Indicators

Figure 2-5 shows the regulator indicators and table 2-7 describes them. ZIF columns do not have -2.2 V regulator boards.

NOTE

Overvoltage (OV), undercurrent (UC), and overcurrent (OC) faults cause a fault indication on the PD box.

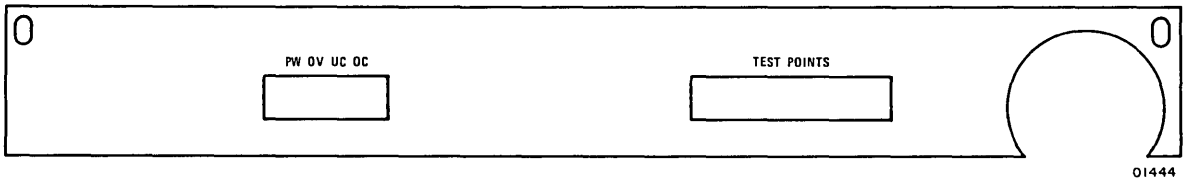


Figure 2-5. LSI and ZIF Column -2.2 V Regulator Indicators

Table 2-7. LSI and ZIF Column -2.2 V Regulator Indicators

Panel Nomenclature	Description	Function
PW	Indicator	Indicates that internal housekeeping power is on.
OV	Indicator	Indicates that regulator voltage exceeds -2.53 V. Removes column power immediately upon fault detection.
UC	Indicator	Indicates that regulator current is less than 85% of nominal. Removes column power immediately upon fault detection.
OC	Indicator	Indicates that regulator current exceeds 115% of nominal. Removes column power immediately upon fault detection.

GH251-A Water Cooling Unit Controls and Indicators

GH251-A controls and indicators are on the 50/60-Hz power disconnect box. Figure 2-6 shows the controls and indicators and table 2-8 describes them.

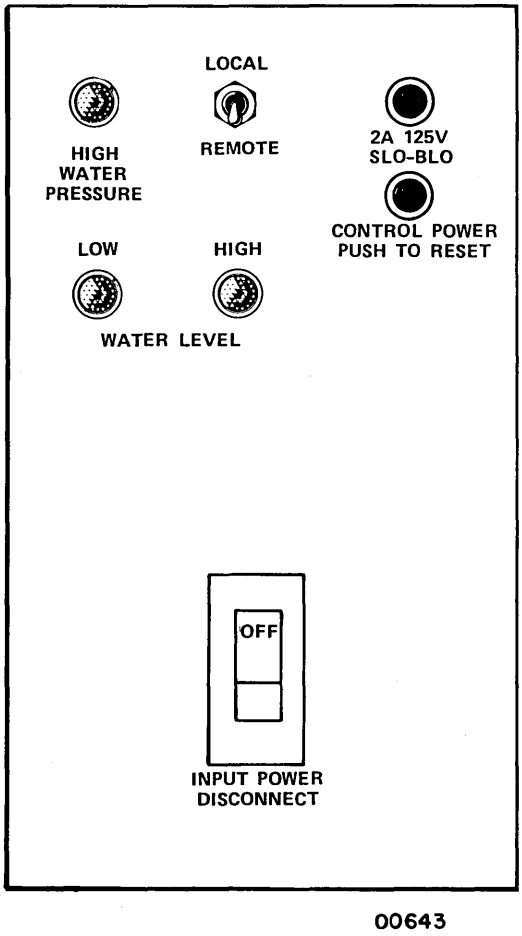


Figure 2-6. GH251-A 50/60-Hz Power Disconnect Box Controls and Indicators

Table 2-8. GH251-A 50/60-Hz Power Disconnect Box Controls and Indicators

Panel Nomenclature	Description	Function
HIGH WATER PRESSURE	Indicator	Indicates water pressure in the cooling system lines has reached 414 kPa (60 psi).†
LOCAL, REMOTE	Toggle Switch	Enables remote control of cooling unit start-up in REMOTE position. Enables local control of cooling unit in a service mode in LOCAL position.
2A, 125-V SLO-BLO	Fuse	Provides input overcurrent protection for the transformers in the 50/60-Hz power control box.
LOW WATER LEVEL	Indicator	Indicates low water level in water tank.†
HIGH WATER LEVEL	Indicator	Indicates high water level in water tank.†
CONTROL POWER PUSH TO RESET	Circuit Breaker	Provides input overcurrent protection for fault detection circuit in the 50/60-Hz power control box.
INPUT POWER DISCONNECT	Circuit Breaker	Applies 50/60-Hz power to cooling unit 50/60-Hz power control box.

†Refer to cooling system manual listed in preface for additional information.

GH251-C Water Cooling Unit Controls and Indicators

GH251-C controls and indicators are on the 50/60-Hz power distribution box. Figure 2-6.1 shows the controls and indicators and table 2-8.1 describes them.

Table 2-8.1. GH251-C 50/60-Hz Power Distribution Box Controls and Indicators

Panel Nomenclature	Description	Function
LOW WATER PRESSURE	Indicator/ Switch	Indicates that pump outlet pressure has dropped to 28 kPa (4 psi) or less. Switch allows indicator to be turned off if low pressure condition exists less than 8 seconds.†
HIGH WATER PRESSURE	Indicator/ Switch	Indicates that pump outlet pressure has reached 28 kPa (4 psi) less than maximum outlet pressure. Switch allows indicator to be turned off if high pressure condition exists less than 8 seconds.†
LOW TEMP	Indicator/ Switch	Indicates that a dewpoint fault has been detected. Switch allows indicator to be turned off if low room temperature condition exists less than 8 seconds.†
LOW WATER LEVEL	Indicator/ Switch	Indicates low water level in water tank. Switch allows indicator to be turned off if low water level condition exists less than 8 seconds.†
HIGH WATER LEVEL	Indicator/ Switch	Indicates high water level in water tank. Switch allows indicator to be turned off if high water level condition exists less than 8 seconds.†
2A 125V SLO BLO	Fuse and Indicator	Provides input overcurrent protection for 125-V ac used for various control functions. Indicator lights to indicate blown fuse.
LOCAL/REMOTE	Toggle Switch	In REMOTE position, enables remote control of water cooling unit startup. In LOCAL position, enables local control of water cooling unit in service mode.
CONT PWR PUSH TO RESET	Circuit Breaker	Provides input overcurrent protection for 24-V ac used by modulating motor supply on interface assembly.
.125A 125V SLO BLO	Fuse and Indicator	Provides input overcurrent protection for 24-V ac power used by 24-V dc power supply on interface assembly. Indicator lights to indicate blown fuse.
INPUT POWER DISCONNECT	Circuit Breaker	Applies 50/60-Hz power to cooling unit's 50/60-Hz power distribution box.

†If the fault remains longer than 8 seconds, the indicator can be reset after the fault has cleared by cycling the INPUT POWER DISCONNECT circuit breaker to off and then to on.

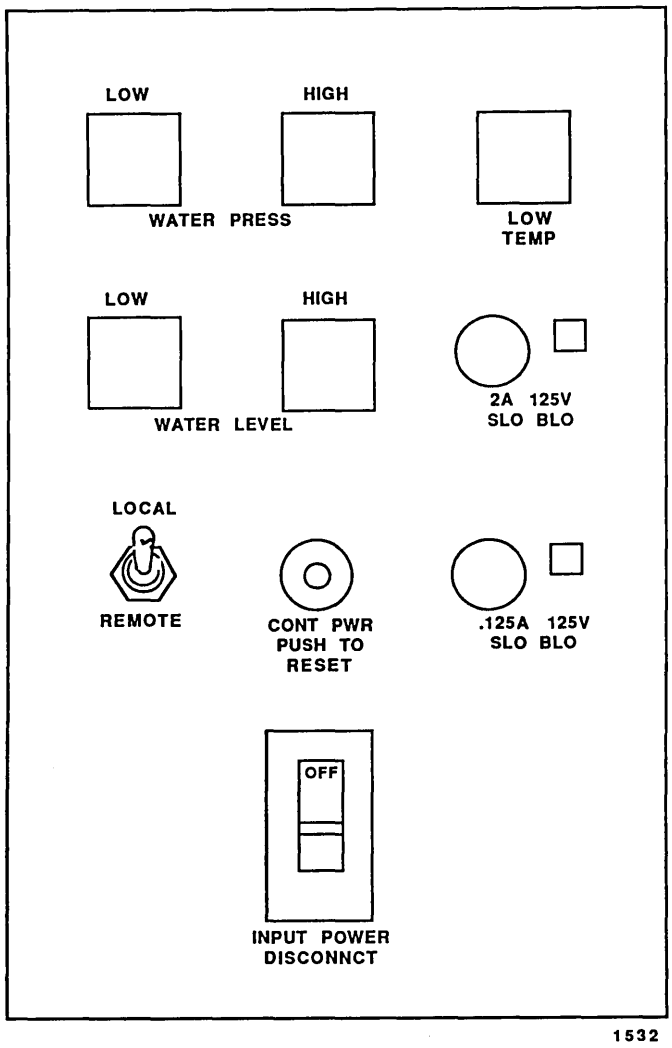


Figure 2-6.1. GH251-C 50/60-Hz Power Distribution Box Controls and Indicators

GH252-A Water Cooling Unit Controls and Indicators

GH252-A controls and indicators are on the 50/60-Hz power disconnect box and on the indicator panel. Figure 2-7 shows the power disconnect box controls and table 2-9 describes them. Figure 2-8 shows the indicator panel controls and indicators, and table 2-10 describes them.

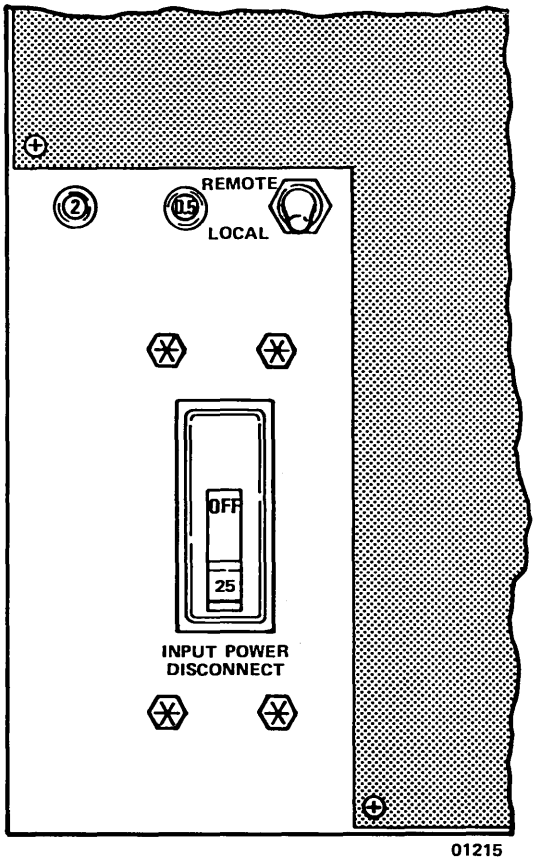


Figure 2-7. GH252-A Power Disconnect Box Controls

Table 2-9. GH252-A Power Disconnect Box Controls

Panel Nomenclature	Description	Function
2	Circuit Breaker	Protects internal step-down transformer.
0.5	Circuit Breaker	Protects internal transformer that supplies protect board.
REMOTE, LOCAL	Switch	Sets unit for local or remote (SPM) control.
INPUT POWER DISCONNECT	Circuit Breaker	Disconnects 50/60-Hz input power to unit.

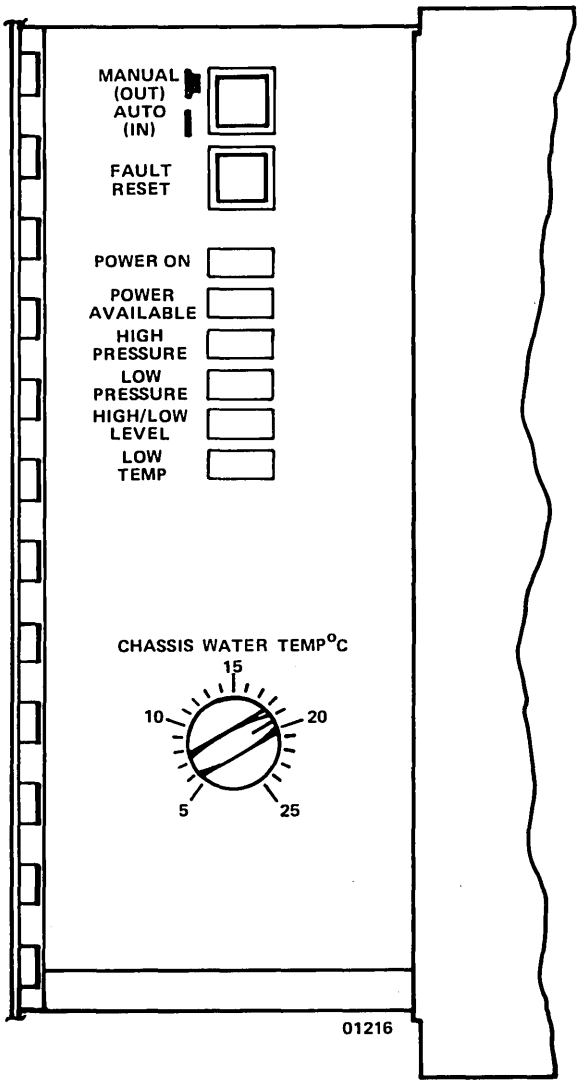


Figure 2-8. GH252-A Indicator Panel Controls and Indicators

Table 2-10. GH252-A Indicator Panel Controls and Indicators

Panel Nomenclature	Description	Function
MANUAL (OUT), AUTO (IN)	Switch	When not depressed, cooling unit controls logic chassis temperature at set-point. When depressed, SPM controls logic chassis temperature (set-point sets lower limit). Refer to CHASSIS WATER TEMPERATURE °C.
FAULT RESET	Switch	When pressed, resets cooling unit after a fault condition removes power (if no faults exist).
POWER ON	Indicator	Indicates that the cooling unit is operating.
POWER AVAILABLE	Indicator	Indicates that 50/60-Hz power is applied internally and that the unit will function under remote control.
HIGH PRESSURE	Indicator	Indicates that water pressure in the cooling lines has reached 410 kPa (60 psi).
LOW PRESSURE	Indicator	Indicates that water pressure in the cooling lines has decreased to 138 kPa (20 psi).
HIGH/LOW LEVEL	Indicator	Indicates that water tank level is less than approximately one-third full or more than approximately three-fourths full.
LOW TEMPERATURE	Indicator	Indicates condensation on the tube that feeds the output manifold or, if the manifold is in a remote location, on the output manifold itself. Can also indicate the cable to J1 on temperature regulator board is not connected.
CHASSIS WATER TEMPERATURE °C	Potentiometer	Adjusts temperature control point when in MANUAL mode, or sets lower temperature limit when in AUTO mode. Refer to MANUAL (OUT)/AUTO (IN).

AB115-A (IOU) Controls and Indicators

AB115-A controls and indicators are on the 50/60-Hz and 400-Hz power control boxes. Figure 2-9 shows the 50/60-Hz power control box controls and indicators and table 2-11 describes them. Figure 2-10 shows the 400-Hz power control box controls and indicators and table 2-12 describes them.

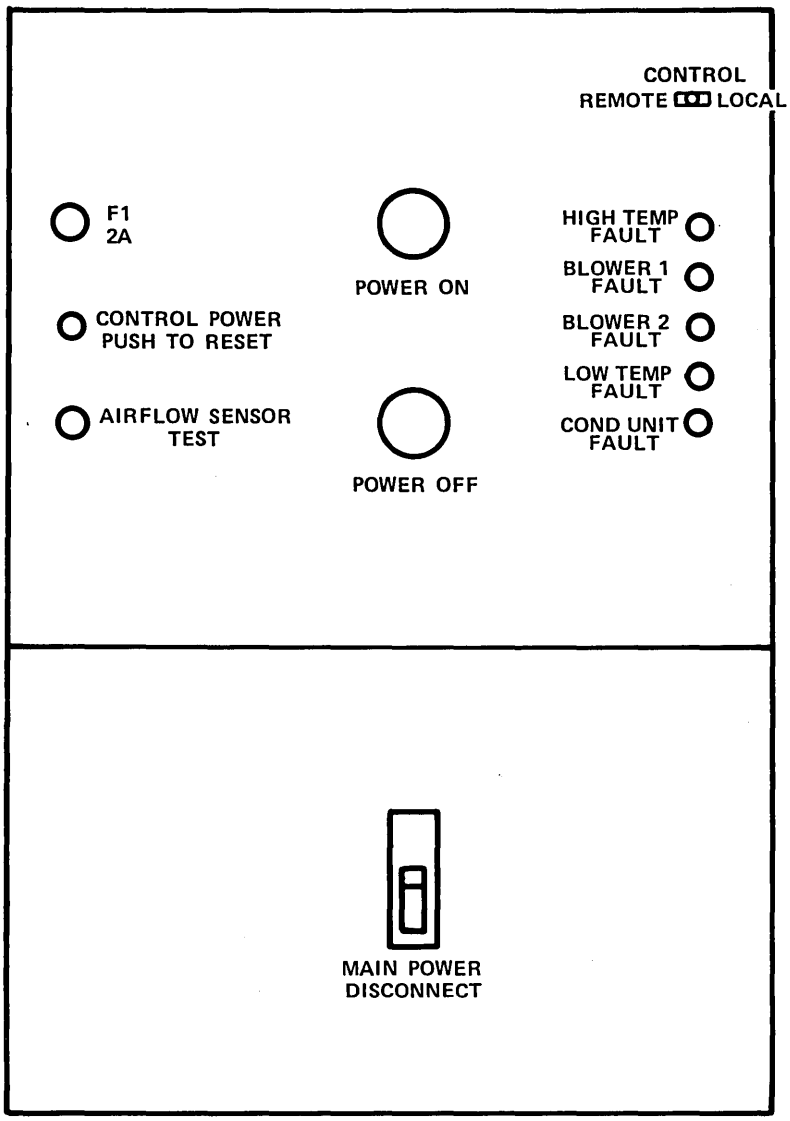


Figure 2-9. AB115-A 50/60-Hz Power Control Box Controls and Indicators

Table 2-11. AB115-A 50/60-Hz Power Control Box Controls and Indicators (Sheet 1 of 2)

Panel Nomenclature	Description	Function
MAIN POWER DISCONNECT	Circuit Breaker	Applies 50/60-Hz power to 50/60-Hz PCB and cabinet condensing unit.
POWER ON	Push-button	If all circuit breakers are closed and CONTROL switch is in LOCAL position, applies 50/60-Hz power to blowers and solenoids in condensing unit. Resets any FAULT LEDs that are lit. Applies 50/60-Hz power to cabinet blowers and 400-Hz M-G power to logic power supplies. If CONTROL switch is in REMOTE position, these functions are controlled by REMOTE ENABLE/LOCAL START on the SPM (table 2-1) or other remote system. The switch must be in REMOTE position to enable the environmental status to the IOU cabinet.
POWER OFF	Push-button Switch (three-second delayed release)	Removes 50/60-Hz power from cabinet and condensing unit blowers and from condensing unit solenoids. Removes 400-Hz M-G power from logic power supplies.
CONTROL POWER PUSH TO RESET	Circuit Breaker	Interrupts +24-V, 50/60-Hz power to 50/60-Hz PCB fault detection logic and local Start/Run sensing logic if overcurrent occurs. Can be manually reset.
AIRFLOW SENSOR TEST	Toggle Switch (spring-loaded return)	In down position, interrupts 50/60-Hz power to cabinet blowers to test BLOWER 1 FAULT and BLOWER 2 FAULT sensors and LEDs.
CONTROL REMOTE LOCAL	Toggle Switch	In REMOTE position, enables remote control of POWER ON switch functions; enables processor to receive Short Warning status signal for cabinet high temperature fault, condensing unit fault, or cabinet blower fault (refer to HIGH TEMP FAULT, BLOWER FAULT, and COND UNIT FAULT, following); enables Long Warning status signal to cabinet logic for cabinet high temperature warning 35 °C (95 °F) or cabinet low temperature (refer to LOW TEMP FAULT, following).

Table 2-11. AB115-A 50/60-Hz Power Control Box Controls and Indicators (Sheet 2 of 2)

Panel Nomenclature	Description	Function
CONTROL REMOTE LOCAL (Contd)	Toggle Switch (Contd)	In REMOTE position on IOU 50/60-Hz PCB, enables Long Warning status signal to IOU cabinet logic for room environmental warning from SPM (refer to section 1). In LOCAL position, enables local control of POWER ON switch functions (refer to preceding POWER ON) disables status signal to processor and IOU for any cabinet fault.
HIGH TEMP FAULT †	Indicator Light	Indicates that cabinet temperature has reached 48.9 °C (120 °F).
BLOWER 1 FAULT †	Indicator Light	Indicates that cabinet blower 1 is no longer running or has failed to keep cabinet temperature below 54.4 °C (130 °F).
BLOWER 2 FAULT †	Indicator Light	Indicates that cabinet blower 2 is no longer running or has failed to keep cabinet temperature below 54.4 °C (130 °F).
LOW TEMP FAULT †	Indicator Light	Indicates that cabinet temperature has reached 13.9 °C (57 °F).
COND UNIT FAULT †	Indicator Light	Indicates that a high head pressure fault has occurred in the cabinet condensing unit compressor.

† All fault LEDs remain lit after fault is corrected until POWER ON is pressed.

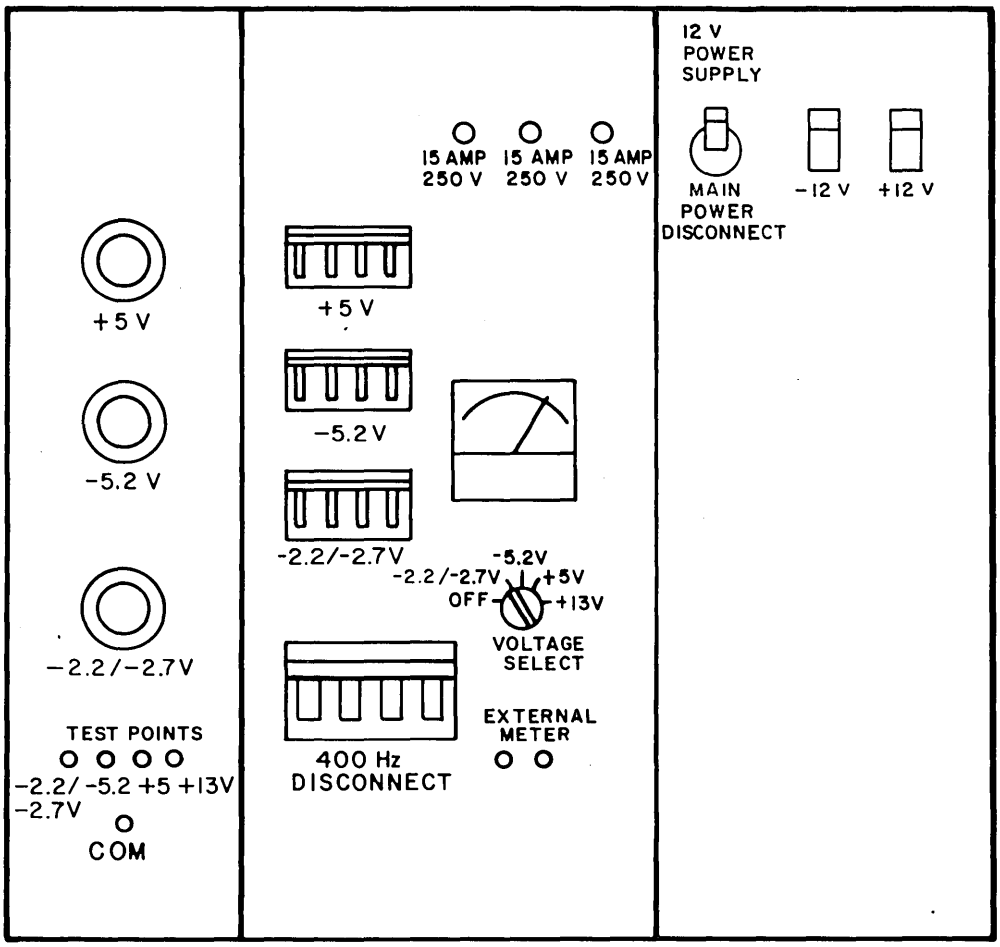


Figure 2-10. AB115-A 400-Hz Power Control Box Controls and Indicators

Table 2-12. AB115-A 400-Hz Power Control Box Controls and Indicators

Panel Nomenclature	Description	Function
400-Hz DISCONNECT	Circuit Breaker	Applies 400-Hz power from system MG to 400-Hz PCB.
-2.2/-2.7 V, -5.2 V,	Circuit Breakers	Apply 400-Hz power to corresponding cabinet logic power supply.
VOLTAGE SELECT	Rotary Switch	Selects low-voltage power supply output for display on percentage meter.
	Percentage Meter	Indicates percent deviation of selected low-voltage power supply output from nominal value.
EXTERNAL METER	Test jacks	Allow connection of external test equipment to output of low-voltage power supply selected by VOLTAGE SELECT.
-2.2/-2.7 V, -5.2 V, +5 V	Variable Autotransformers	Adjust outputs of corresponding power supply, as shown on percentage meter.
-2.7 V, -5.2 V, +5 V, +13 V, COM	Test Jacks	Allow connection of external test equipment to output of corresponding logic power supply.
12 V POWER SUPPLY MAIN POWER DISCONNECT	Circuit Breaker	Applies 120-V, 400-Hz power to +12-V supply and power regulator.
-12 V, +12 V	Circuit Breakers	Trip in response to OV/OC conditions detected by (or failure of) +12-V power supply regulator.
15 AMP, 250V	Fuses	Provide OC protection for +5-V transformer in 400-Hz PCB.

BS174-A/BS175-A Central Memory Controls and Indicators

BS174-A/BS175-A controls and indicators are on the power control indicator, -5.2 V adjust panel, 400-Hz power control box, and on the temperature, current, and voltage protection assembly.

BS174-A/BS175-A Power Control Indicator

Figure 2-11 shows the power control panel and indicators. Table 2-13 lists the panel nomenclature, description, and the control and indicator functions.

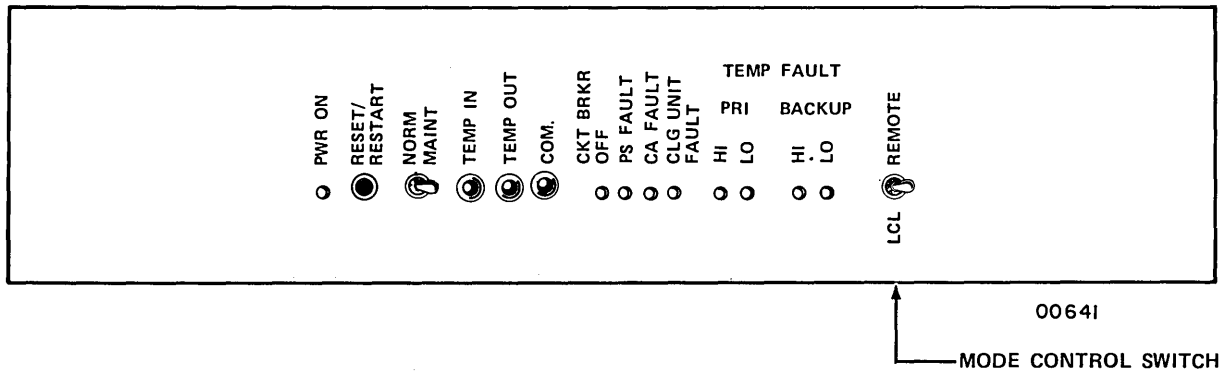


Figure 2-11. BS174-A/BS175-A Power Control Board Indicator

CPM chassis
v 845

Table 2-13. BS174-A/BS175-A Power Control Board Indicator Controls and Indicators

Panel Nomenclature	Description	Function
LCL, REMOTE	Toggle Switch	REMOTE position is not used. In LCL position, cabinet energizes whenever 400-Hz power is applied providing no faults are present and all circuit breakers are in the ON position.
TEMP FAULT BACKUP		
LO	Indicator Light	Indicates cabinet inlet water temperature is below the cabinet dewpoint temperature.
HI	Indicator Light	Indicates a memory cage temperature has 38 to 41 °C (100.4 to 105 °F).
TEMP FAULT PRI		
LO	Indicator Light	Indicates cabinet inlet water temperature has reached 14 ±1.2 °C (57.2 ±2.2 °F).
HI	Indicator Light	Indicates a memory cage temperature has reached 32 to 34 °C (89.6 to 93.2 °F).
CLG UNIT FAULT	Indicator Light	Not used.
CA FAULT	Indicator Light	Indicates loose, broken, or disconnected plug-jack connection.
PS FAULT	Indicator Light	Indicates logic power loss due to tripped circuit breaker in response to a fault condition.
CKT BRKR OFF	Indicator Light	Indicates a logic power supply circuit breaker is in the OFF position.
COM, TEMP OUT, TEMP IN	Test Jacks	Allow connection of external test equipment to monitor cabinet temperature. The TEMP IN jack provides the inlet water temperature; the TEMP OUT jack provides the average temperature of the four memory cages.
NORM MAINT	Toggle Switch	The NORM position allows for normal operation. The MAINT position disables all logic power supplies to allow warning system testing.
RESET, RESTART	Push-button	Clears transient fault LED indicators and restores cabinet power.
PWR ON	Indicator Light	Indicates 400-Hz power present at the logic power supplies.

BS174-A/BS175-A -4.7 V Adjust Panel

Figure 2-12 shows the -4.7 V adjust panel and indicators. Table 2-14 lists the panel nomenclature, description, and the control and indicator functions.

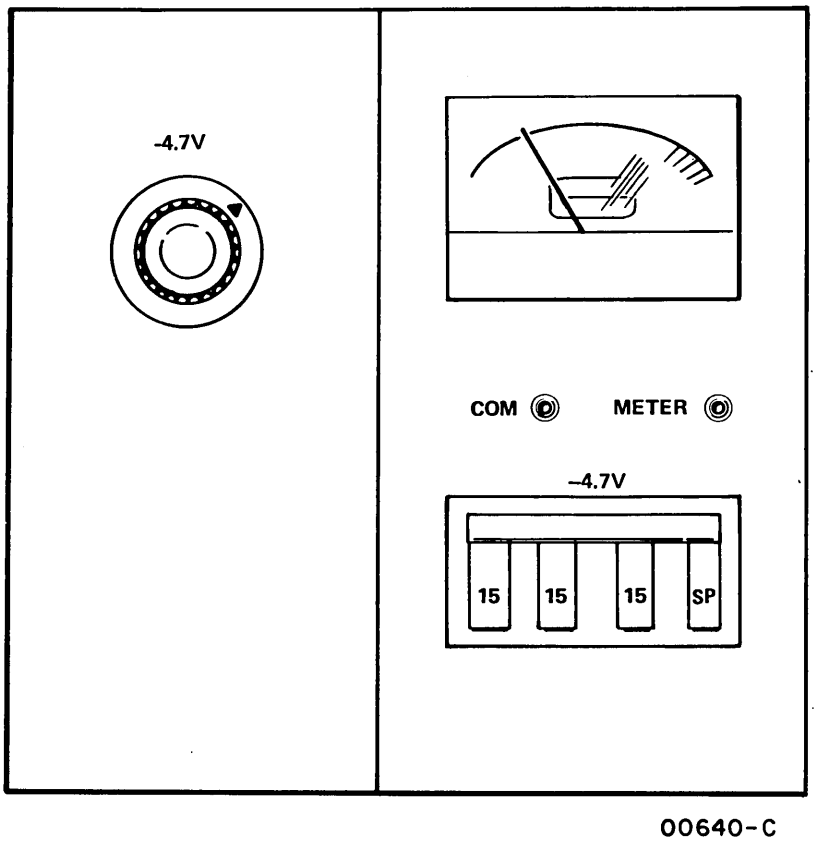


Figure 2-12. BS174-A/BS175-A -4.7 V Adjust Panel (Right-Hand View)

Table 2-14. BS174-A/BS175-A -4.7 V Adjust Panel

Panel Nomenclature	Description	Function
-4.7 V ††	Variable Autotransformer	Adjusts output of -4.7 V logic power supply as shown on percentage meter.
†	Percentage Meter	Indicates percentage deviation of -5.2 V power supply from nominal value.
-4.7 V ††	Circuit Breaker	Applies input power to adjust panel.
COM, METER	Test Jacks	Allow connection of external test equipment to monitor -2.2 V logic power supply.

† No panel marking.
†† Adjust panels built under part number 18988273 (right hand) or 22697007 (left hand) have -5.2 V nomenclature for the variable autotransformer and circuit breaker. Nomenclature must be changed to -4.7 V. To do this, peel -4.7 V tag (part number 24615712) from old adjust panel and place it over the -5.2 V nomenclature on the new assembly.

BS174-A/BS175-A 400-HZ Power Control Box

Figure 2-13 shows the 400-Hz power control box controls and indicators. Table 2-15 lists the panel nomenclature, description, and the control and indicator functions.

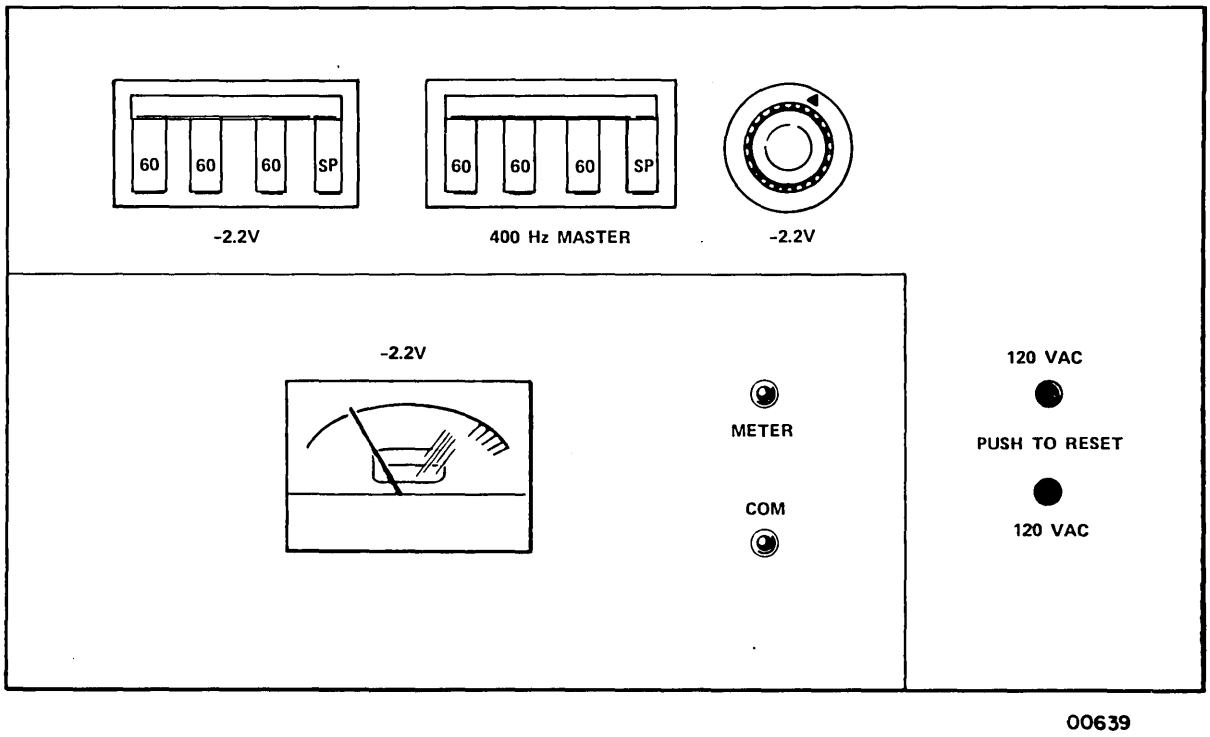


Figure 2-13. BS174-A/BS175-A 400-Hz Power Control Box

Table 2-15. BS174-A/BS175-A 400-Hz Power Control Box

Panel Nomenclature	Description	Function
400-Hz MASTER	Circuit Breaker	Applies 400-Hz power from system MG to 400-Hz power control box.
-2.2 V	Circuit Breaker	Applies 400-Hz power to -2.2 V logic power supply.
-2.2 V	Variable Autotransformer	Adjusts output of -2.2 V power supply as shown on percentage meter.
-2.2 V	Percentage Meter	Indicates percentage deviation of -2.2 V power supply from nominal value.
METER, COM	Test Jacks	Allow connection of external test equipment to monitor -2.2 V logic power supply.
120-V AC PUSH TO RESET 120-V AC	Circuit Breakers	Provide input overcurrent protection for the ±16 V and ±24 V control voltage power supplies.

BS174-A/BS175-A Temperature, Current, and Voltage Protection Assembly

Figure 2-14 shows the TCVP panel and indicators. Table 2-16 lists the panel nomenclature, description, and the control and indicator functions.

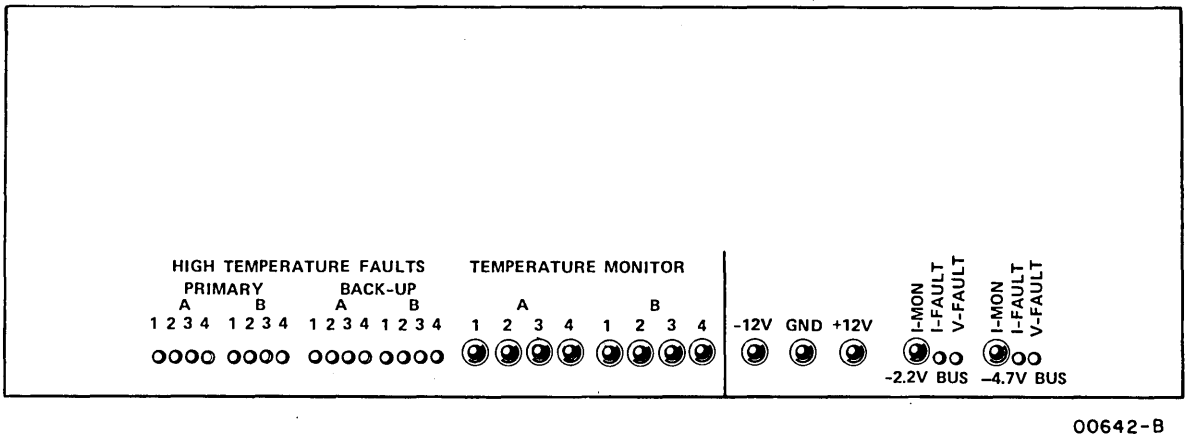


Figure 2-14. BS174-A/BS175-A Temperature, Current, and Voltage Protection Assembly

Table 2-16. BS174-A/BS175-A Temperature, Current, and Voltage Protection Assembly Controls and Indicators

Panel Nomenclature	Description	Function
-4.7 V BUS V-FAULT, I-FAULT	Indicators	Indicate transient voltage and/or current fault conditions with the -4.7 V logic voltage.
-2.2 V BUS V-FAULT, I-FAULT	Indicators	Indicate transient voltage and/or current fault conditions with the -2.2 V logic voltage.
-4.7 V BUS I-MON, -2.2 V BUS I-MON	Test Jacks	Allow connection of external test equipment to monitor current drawn by the -4.7 V and -2.2 V buses.
+12 V, GND, -12 V	Test Jacks	Allow connection of external test equipment to monitor the input power to the TCVP assembly.
TEMPERATURE MONITOR A, B 1, 2, 3, 4	Test Jacks	Allow connection of external test equipment to monitor temperature of the eight cooling passes on each memory cage. †
HIGH TEMPERATURE FAULTS BACK-UP A,†† B ††† 1, 2, 3, 4	Indicators	Indicate memory cage temperature of one (or more) of the eight memory cage cooling passes has reached 38 °C to 41 °C (100.4 °F to 105 °F).
HIGH TEMPERATURE FAULTS PRIMARY A,†† B ††† 1, 2, 3, 4	Indicators	Indicate memory cage temperature of one (or more) of the eight memory cooling passes has reached 32 °C to 34 °C (89.6 °F to 93.2 °F).

† With voltmeter set to 200-mV range, 1 mV = 1 °C.
†† A indicates the upper four memory cage cooling passes.
††† B indicates the lower four memory cage cooling passes.

SYSTEM POWER APPLICATION AND REMOVAL

This manual primarily covers the SPM and CYBER 180 Models 840, 850, 860, 990; CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E; and CYBERPLUS computer systems and associated equipment units. However, the power systems for these systems can be interconnected with various other systems. Therefore, a basic understanding of power configuration is required for proper application and removal of power.

Power Configuration

A power configuration consists of one or more wall boxes and the unit power subsystems. A wall box controls power to the units or some of the units related to a system. Different types of systems use different types of wall boxes. Wall boxes can be connected so that one wall box controls a similar wall box or a different type of wall box. Refer to Section 5, Diagrams, for additional power system information.

A wall box controls one, some, or all of the following associated units:

- MGs
- Cooling Systems
- Peripherals
- Logic Columns

In addition to controlling its associated units, a wall box can function in master/slave combinations with other wall boxes. A master wall box controls its associated units and a slave wall box. The slave wall box, in turn, controls its associated units. The types of wall boxes used with different systems are:

- SPM (System Power Monitor) - Used with CYBER 180 Models 820, 830, 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E
- SPCP (System Power Control Panel) - Used with CYBER 170 Models 815, 825, 835, 845, 855
- TMPC (Temperature Power Control Panel) - Used with CYBER 170 Models 171-176, 720, 730, 740, 750, 760, 865, 875

NOTE

CYBERPLUS parallel processors can function with any of these systems.

One of two operating modes (remote 1 or remote 2) controls the master/slave function. In remote 1 mode, relay contact closure or 120-V ac, originating at the master, activates the slave. In remote 2 mode, 24-V dc, originating at the master, activates the slave.

Table 2-17 relates the wall boxes, master/slave function, and operating modes.

Table 2-17. Wall Boxes, Master/Slave Function, and Operating Modes

Wall Box	Master	Slave
SPM	Remote 1 Mode	Remote 1/Remote 2 Modes
SPCP	Remote 1/Remote 2 Modes	Remote 1/Remote 2 Modes
TMPC	Remote 1 Mode	No Slave Function

A TMPC can control its associated units and one or more SPM(s) and/or SPCP(s). An SPCP can control its associated units and one or more SPCP(s) and/or SPM(s). An SPM can control its associated units and one or more SPM(s) and/or SPCP(s) in remote 1 mode only. More than one master can control a given slave (SPM and SPCP remote 1 mode only). Figure 2-15 shows four examples of many possible configurations.

Power Application and Removal Procedures

Power procedures consist of those for normal power control, power application after a fault, recovery power application, emergency power removal, and maintenance power control. Recovery power application applies only to condensing unit-cooled equipment. The procedures apply primarily to the SPM and units used with the SPM, as indicated in following text. References to other manuals are given where required.

Normal Power Application

Before performing a normal power application procedure:

- Determine which associated units require power.
- For logic columns and GH251-A, GH251-C, GH252-A, AB115-A, and BS174-A/BS175-A units that require power, set for remote operation as described under Power Application and Removal Procedures in this section.
- For other associated units that require power, refer to the appropriate power distribution and warning manual.

Applying Power at an Independent Wall Box: This procedure applies power to an independent SPM and all associated units. If applying power at an SPCP or TMPC, refer to the appropriate power distribution and warning manual.

1. Set SYSTEM DISCONNECT switch on side of SPM to ON.
2. Set mode switch on side of SPM to LOCAL.
3. Set left rotary switch on front of SPM to M-G 1.

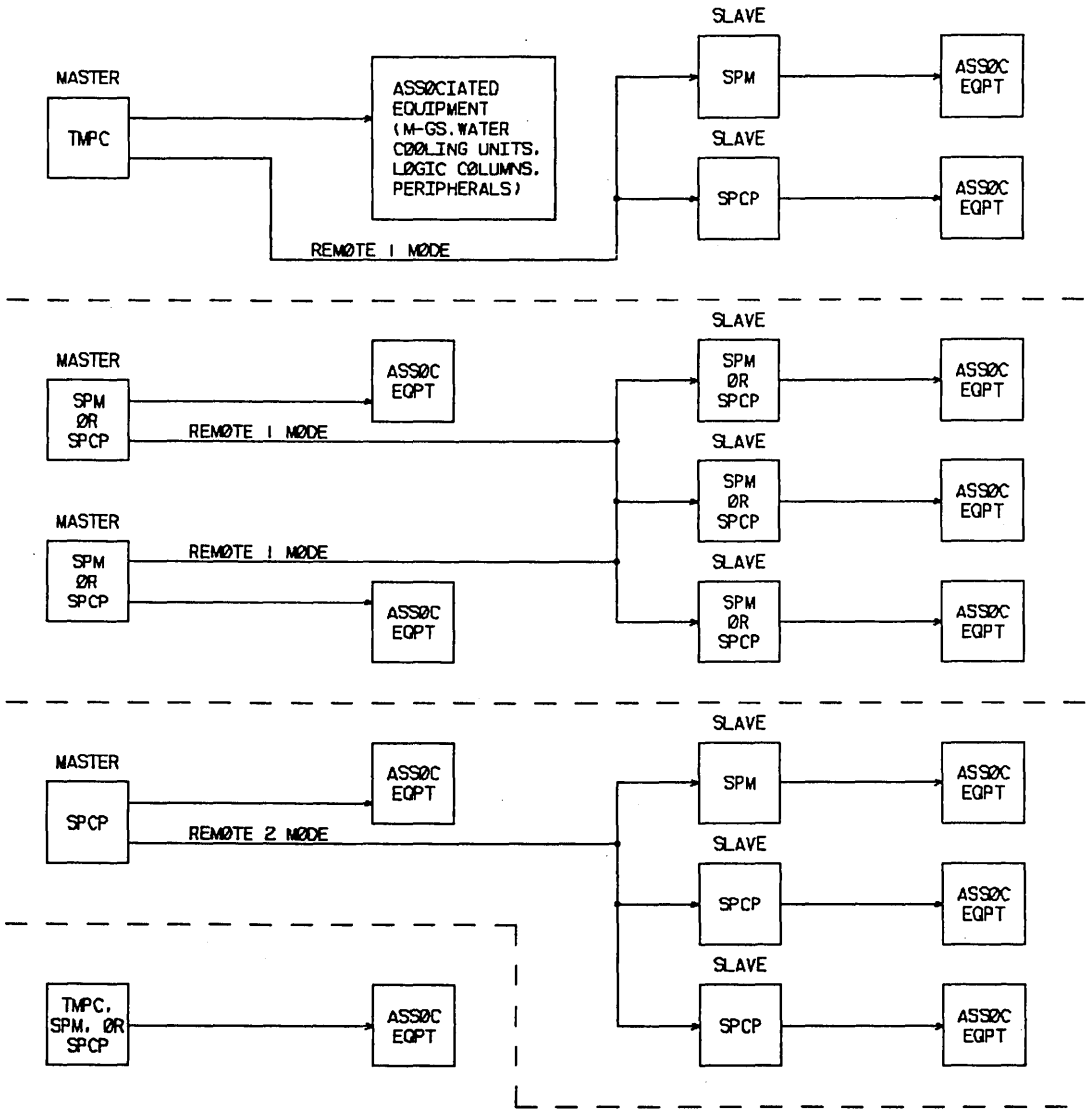


Figure 2-15. Possible Power Configurations

4. Press and hold LOCAL START/REMOTE ENABLE switch on SPM for two seconds. The ROOM ON indicator lights when the switch is pressed, and SYSTEM ON lights after the two-second interval. Power is applied to the cooling systems, MGs, logic columns, and peripheral equipment controlled by the SPM. For more detail on the power application sequence, refer to System Power Application Sequence in section 5, Diagrams.

5. Observe M-G phases 1, 2, and 3 on the SPM digital display. MG is stable when each phase reads 120-V after approximately one minute.

6. Repeat step 5 for M-G 2 and M-G 3 (if present).

Applying Power at a Master Wall Box: This procedure applies power to master and slave SPM, and to their associated units.

- Slave SPM:

  If applying power at a master SPCP or TMPC, perform steps 1 through 4 to make slave SPM ready for remote control. Refer to the appropriate power distribution and warning manual to operate the master SPCP or TMPC.

  1. Set SYSTEM DISCONNECT switch on side of slave SPM to ON.

  2. Set mode switch on side of slave SPM to REMOTE 1 or REMOTE 2 according to system configuration.

  3. If SPM controls MGs, set left rotary switch on front of slave SPM to M-G 1.

  4. Press and release LOCAL START/REMOTE ENABLE switch on slave SPM. ROOM ON indicator lights, indicating that slave SPM is ready for control by master wall box.

NOTE

On master and slave SPMs that control MGs, observe phases 1, 2 and 3 on the digital display for each MG in the system. MG is stable when each phase reads 120-V (after approximately one minute).

Power is applied to cooling systems, MGs, logic columns, and peripheral equipment controlled by master and slave SPMs. For additional information on the power application sequence, refer to System Power Application Sequence in section 5, Diagrams.

- Master SPM:

  If applying power at a master SPM that controls slave SPCP, refer to appropriate power distribution and warning manual to make the slave SPCP ready for remote control, then perform steps 1 through 4 to operate master SPM.

  1. Set SYSTEM DISCONNECT switch on side of master SPM to ON.
  2. Set mode switch on side of master SPM to REMOTE 1. †
  3. If SPM controls MGs, set left rotary switch on front of master SPM to M-G 1.
  4. Press and hold LOCAL START/REMOTE ENABLE switch on master SPM for two seconds. ROOM ON indicator lights when switch is pressed, and SYSTEM ON indicator lights after a two-second interval.

Applying Power At A Slave Wall Box: If applying power at a slave SPCP, refer to the appropriate power distribution and warning manual. To apply power at a slave SPM, perform the procedure under Applying Power at an Independent Wall Box in this section. This results in application of power to the slave SPM and all its associated equipment.

Power Application After Fault: Equipment associated with an SPM must be reset after a fault condition in the equipment is corrected. Refer to Power Application and Removal Procedures in this section or refer to the applicable power distribution and warning manual. Pressing the LOCAL START/REMOTE ENABLE switch resets an SPM after correction of a fault condition.

Recovery Power Application: This procedure is used only with condensing unit cooled equipment (when off for more than two hours). Refer to AB115-A IOU Power Application and Removal in this section.

Normal Power Removal: To remove power from a system via an SPM, press and release the STOP switch on the associated SPM. If the SPM is a master, power is removed from the master and slave SPMs and all of their related units. If the SPM is a slave or operating independently, power is removed from the SPM and all units controlled by that SPM. If removing power at an SPCP or TMPC, refer to the appropriate power distribution and warning manual.

Room Emergency-Off: Actuate any ROOM EMERGENCY-OFF switch. All room power is removed.

NOTE

Perform the emergency-off reset procedure applicable to site.

† An SPM does not function as a master in REMOTE 2 mode.

Unit Emergency-Off: Actuate the UNIT EMERGENCY-OFF switch on the cable entry (CYBERPLUS) or interbay (CYBER 180 Models 840, 850, 860, 990 and CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E) section of the cabinet. Power is removed from the associated SPM and the equipment it controls.

NOTE

To reset, set UNIT EMERGENCY-OFF switch on cable entry or interbay section of the cabinet to ON and perform normal restart procedure.

Maintenance Power Control: Local power application/removal to the associated equipment is possible. Refer to Power Application and Removal Procedures in this section or to the applicable power distribution and warning manual.

When the LOCAL/REMOTE switch on a logic column power distribution box is set to LOCAL, warning signals from that column to the SPM are inhibited, and the SPM indicates that column is powered-off.

POWER APPLICATION AND REMOVAL PROCEDURES

Power Application and Removal Procedures for the LSI and ZIF columns; GH251-A, GH251-C, and GH252-A water cooling units; AB115-A IOU; and BS174-A/BS175-A central memory are provided. The procedures cover remote and local modes of operation. Remote is the usual operating mode. Local mode is for maintenance.

LSI and ZIF Column Power Application and Removal

Normal and fault-related power control require different procedures.

LSI and ZIF Column Power Control - Normal

To control power via the SPM:

1. Set the LOCAL/REMOTE switch on the column PD box (figure 2-3) to REMOTE.
2. Set all PD box circuit breakers to ON.
3. Apply power via the SPM (refer to System Power Application and Removal in the following pages).

To control power via local control:

1. Set 2.2-V DISCONNECT and 4.7-V DISCONNECT circuit breakers on column PD box to ON.
2. Set LOCAL/REMOTE switch to LOCAL.
3. Apply power via the 400-Hz DISCONNECT circuit breaker.

When the LOCAL/REMOTE switch on a logic column power distribution box is set to LOCAL, warning signals from that column to the SPM are inhibited, and the SPM indicates that column power is removed. However, upon detection of Chiller Fault, the column removes power.

LSI and ZIF Column Power Control - Fault

It is necessary to reset the equipment after clearing a fault condition.

1. Press RESET switch on the column power distribution box.
2. Set any tripped circuit breakers to ON.
3. Refer to Power Control - Normal via SPM or Local Control procedures in the preceding text to apply power.

GH251-A Water Cooling Unit Power Application and Removal

Power application procedures for the GH251-A water cooling unit consist of those for normal conditions, after a fault-detected shutdown, and after an emergency shutdown. Power removal procedures include those for normal and for emergency conditions.

GH251-A Power Application - Normal

Normal power application procedures depend on whether the water cooling unit cabinet is under remote or local control.

To apply power via SPM (Remote):

1. Set mode switch on 50/60-Hz power disconnect box (figure 2-6) to REMOTE.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box to ON. Cabinet power is applied.
3. To apply power refer to procedures under System Power Application and Removal.

To apply power via local:

1. Set mode switch on 50/60-Hz power disconnect box (figure 2-6) to LOCAL.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box to ON. Cabinet power is applied.

GH251-A Power Application - Recovery

If power is removed by activating an emergency-off switch, reset switch according to unit emergency-off recovery procedure under System Power Application and Removal.

If power is removed by fault detection logic, correct fault. Unit starts if:

- Mode switch is set to LOCAL and power is applied.
- Mode switch is set to REMOTE and a power application function has been performed at the SPM.

GH251-A Power Removal - Normal

Power removal procedures depend on whether the water cooling unit cabinet is under remote or local control.

To remove power via SPM (Remote), refer to procedures under System Power Application and Removal.

To remove power via local power removal, set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box (figure 2-6) to OFF. Cabinet power is removed.

GH251-C Water Cooling Unit Power Application and Removal

Power application procedures for the GH251-C water cooling unit consist of those for normal conditions, after a fault-detected shutdown, and after an emergency shutdown. Power removal procedures include those for normal and for emergency conditions.

GH251-C Power Application - Normal

Normal power application procedures depend on whether the water cooling unit cabinet is under remote or local control.

To apply power via SPM (Remote):

1. Set mode switch on 50/60-Hz power distribution box (figure 2-6.1) to REMOTE.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power distribution box to ON. Cabinet power is applied.
3. To apply power refer to procedures under System Power Application and Removal.

To apply power via local:

1. Set mode switch on 50/60-Hz power distribution box (figure 2-6.1) to LOCAL.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power distribution box to ON. Cabinet power is applied.

GH251-C Power Application - Recovery

If power is removed by activating an emergency-off switch, reset switch according to unit emergency-off recovery procedure under System Power Application and Removal.

If power is removed by fault detection logic, correct fault. Unit starts if:

- Mode switch is set to LOCAL, power is applied, and INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power distribution box (figure 2-6.1) is cycled to off and then to on.
- Mode switch is set to REMOTE, a power application function has been performed at the SPM, and INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power distribution box (figure 2-6.1) is cycled to off and then to on.

GH251-C Power Removal - Normal

Power removal procedures depend on whether the water cooling unit cabinet is under remote or local control.

To remove power via SPM (Remote), refer to procedures under System Power Application and Removal.

To remove power via local power removal, set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box (figure 2-6.1) to OFF. Cabinet power is removed.

GH252-A Water Cooling Unit Power Application and Removal

Power application procedures for the GH252-A water cooling unit consist of those used for normal conditions, after a fault-detected shutdown, and after an emergency shutdown. Power removal procedures include normal and emergency conditions.

GH252-A Power Application - Normal

Normal power application procedures depend on whether the water cooling unit cabinet is under remote or local control.

To apply power via SPM (Remote):

1. Set mode switch on 50/60-Hz power disconnect box (figure 2-6) to REMOTE.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box to ON. Cabinet power is applied and the the unit starts if a power application function has been performed at the SPM.
3. If the unit does not start, refer to procedures under System Power Application and Removal.

To apply power via local:

1. Set mode switch on 50/60-Hz power disconnect box (figure 2-6) to LOCAL.
2. Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box to ON. Cabinet power is applied and unit starts.

GH252-A Power Application - Recovery

If power was removed by activating an emergency-off switch, reset switch according to emergency power-off recovery procedure.

If power was removed by fault detection logic, after fault is corrected press FAULT RESET on indicator panel (figure 2-8). Unit starts if:

- Mode switch is set to LOCAL.
- Mode switch is set to REMOTE and a power application function has been performed at the SPM.

GH252-A Power Removal - Normal

Power removal procedures depend on whether the water cooling unit cabinet is under remote or local control.

To remove power via SPM: Refer to procedures under System Power Application and Removal.

To remove power via local: Set INPUT POWER DISCONNECT circuit breaker on 50/60-Hz power disconnect box (figure 2-6) to OFF. Cabinet power is removed.

AB115-A IOU Power Application and Removal

Power application procedures for the AB115-A IOU consist of those used for normal conditions and initial start-up or recovery.

AB115-A Power Control - Normal

Set the HG (hot gas) and LIQ (liquid) switches on the condensing unit to the up position before power application.

To control power via SPM (Remote):

1. Set all circuit breakers on the 50/60-Hz PCB and 400-Hz PCB (figures 2-9 and 2-10) to ON.

2. Set CONTROL switch on the 50/60-Hz PCB to REMOTE. If properly connected, the SPM now controls power application and removal.

To control power via local:

1. Set all circuit breakers on the 50/60-Hz PCB and 400-Hz PCB to ON.

2. Set the CONTROL switch on the 50/60-Hz PCB to LOCAL.

3. Apply power via the POWER ON and POWER OFF switches on the 50/60-Hz PCB.

AB115-A Power Application - Initial Start-up Or Recovery

If power is removed by fault logic response to high compressor head pressure (COND UNIT FAULT LED lit at 50/60-Hz PCB), the high head pressure switch in the condensing unit must be reset. Refer to the cooling system manual listed in the preface for switch location.

When a condensing unit has been off for two or more hours due to power outage, initial installation, or fault condition, start the compressor first and allow it to run until the coolant gas is pumped back into the compressor from the lines. This is done as follows:

1. Set HG and LIQ switches on condensing unit to up position.

2. Set MAIN POWER DISCONNECT circuit breaker on cabinet 50/60-Hz PCB to ON. Compressor motor starts.

3. Allow compressor to run until coolant pumps down and head pressure drops.

CAUTION

If slugging (liquid refrigerant in the compressor causing loud, rattling sounds) occurs, immediately set MAIN POWER DISCONNECT circuit breaker to the OFF position to prevent damage to compressor. Wait 20 to 30 seconds and reapply power with condensing unit circuit breaker for not more than two or three seconds. Wait another 20 to 30 seconds and repeat. Continue in this manner until slugging stops.

4. Apply power as previously described for normal conditions.

BS174-A/BS175-A Central Memory Power Application and Removal

Power application procedures for the BS174-A/BS175-A central memory cabinet consist of those used for normal conditions, after a fault shutdown, and after an emergency shutdown. Power removal procedures include those used for normal and for emergency conditions.

BS174-A/BS175-A Power Application - Normal

1. Set mode control switch on power control indicator (figure 2-11) to LOCAL.

NOTE

The mode control switch is set to LOCAL because it is not used in this application.

2. Press and release LOCAL START/REMOTE ENABLE switch on SPM. SYSTEM ON indicator lights. In approximately 60 seconds, the 400-Hz voltage select meter on SPM indicates zero percent for all three phases.
3. Set -4.7 V circuit breaker on each -4.7 V adjust panel assembly (figure 2-12) to ON.
4. Set -2.2 V circuit breaker on 400-Hz power control box (figure 2-13) to ON.
5. Set 400-Hz MASTER circuit breaker on 400-Hz power control box to ON. PWR ON indicator on power control indicator lights.

BS174-A/BS175-A Power Application - Recovery

If power is removed by activating an emergency-off switch, reset switch according to customer emergency power-off recovery procedure.

BS174-A/BS175-A Power Application - Fault

If power is removed by fault detection logic and displayed on the power control indicator, the following procedure applies:

1. Reset any fault-tripped circuit breaker(s).

2. Press and release RESET/RESTART switch on power control indicator (figure 2-11). Cabinet power is applied.

BS174-A/BS175-A Power Removal - Normal

Set 400-Hz MASTER circuit breaker on 400-Hz power control box (figure 2-13) to OFF. Cabinet power is removed.

BS174-A/BS175-A Power Removal - Emergency

Activate any emergency-off switch to remove power.

SECTION 3

INSTALLATION AND CHECKOUT

(Refer to the applicable Installation and Checkout Manual listed in the preface for information concerning this section.)

SECTION 4

THEORY OF OPERATION

(Refer to Diagrams, Section 5)

This section contains power diagrams and related text for the following equipment units:

- System Power Monitor (SPM).
- LSI and ZIF logic columns.
- GH251-A water cooling unit.
- GH251-C water cooling unit.
- GH252-A water cooling unit.
- AB115-A input/output unit.
- BS174-A/BS175-A central memory.

Refer to Basic System Configuration in General Description, section 1, for information on which systems use these equipment units. Figure 5-1 shows block diagram conventions.

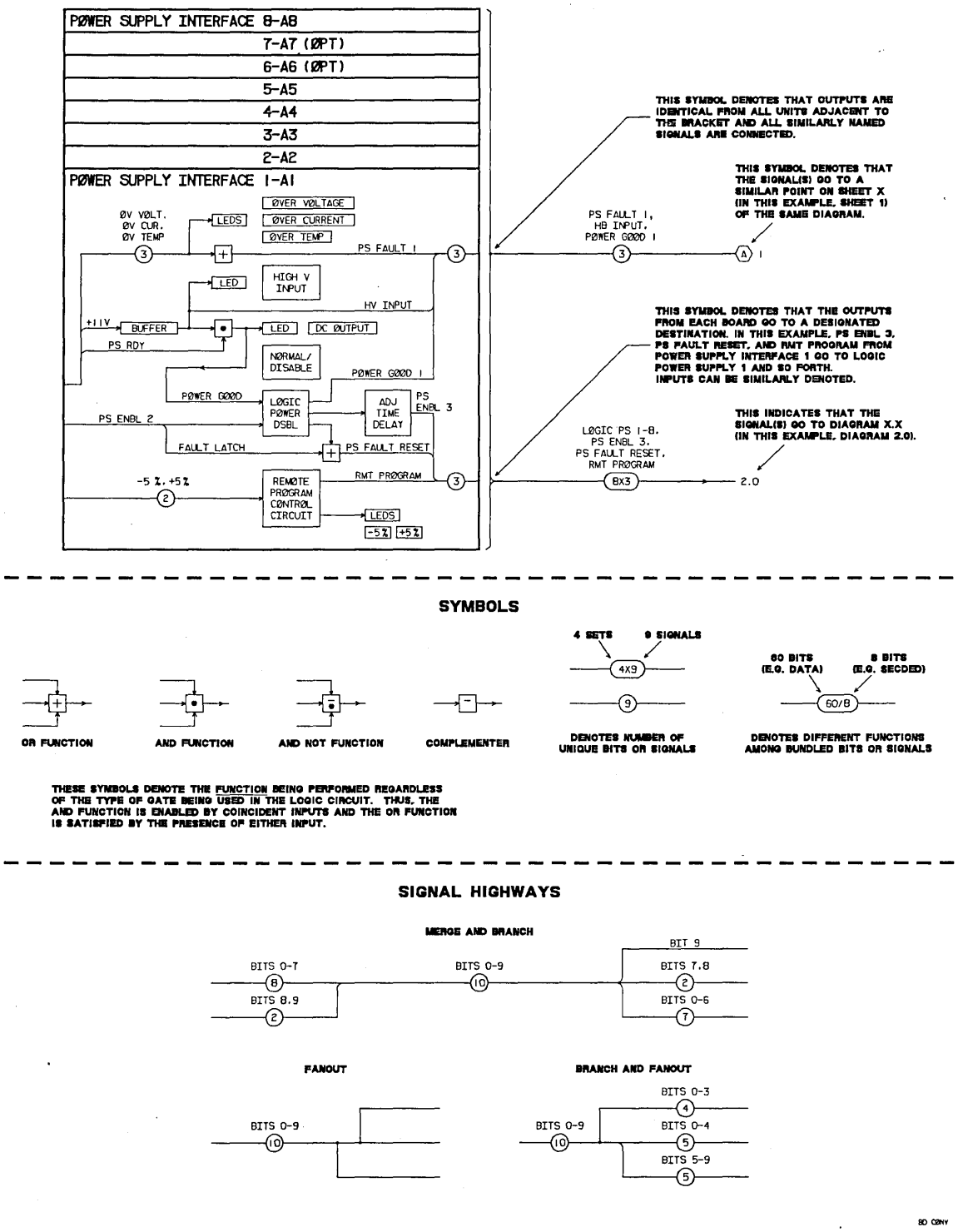


Figure 5-1. Block Diagram Conventions

POWER SYSTEM OVERVIEW

A power system consists of power components related to up to 32 equipment columns, an interbay monitor, SPM and associated M-G sets, and water cooling units. The equipment columns comprise the CP, IOU, and memory units of a system. A system can require up to four M-G sets and up to three water cooling units. Depending on system configuration the cooling units consist of a 50 L/min (14 gal/min), 87 L/min (23 gal/min), and/or 220 L/min (58 gal/min). The Power System Overview diagram (PWR SYS-1) shows the LSI/ZIF column,† interbay monitor or power multiplexer, SPM, and related signals.

Each column provides internal logic power and protection for its logic panels (up to four). A ZIF column contains power supplies which generate unregulated -4.7 V dc and unregulated -2.2 V dc from the 400-Hz input. An LSI column has a power supply which generates unregulated -4.7 V dc and each logic panel has a -2.2 V dc regulator. Both ZIF and LSI columns have a temperature-protect circuit for each logic panel.

The interbay monitor or power multiplexer boards provide an interface between the columns and the SPM. An interbay monitor is used with CYBER 180 Model 990 computer systems. CYBER 180 Models 840, 850, 860; CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E; and CYBERPLUS computer systems use the power multiplexer. Under SPM control, the interbay monitor or power multiplexer provides polling addresses to the system columns (up to 32) and transfers column status information to the SPM. Control signals which apply/remove power to the columns transfer through the interbay monitor or power multiplexer from the SPM. The SPM controls system power application/removal, polls system status, displays system status, and provides alarm and shutdown capability. System power application/removal control includes the columns, M-G sets, water cooling units, peripherals, and SPM internal power. Power application/removal can be local or via a master/slave remote control function. Unit emergency-off capability is provided. Actuating a unit emergency-off switch in the interbay or cable entry cabinet removes power from the SPM and all of the equipment it controls. The SPM operates under internal firmware control.

Table 5-1 describes the signals which connect the system components.

†Some computer systems use other IOU and memory logic. Refer to Basic System Configuration in General Description, section 1.

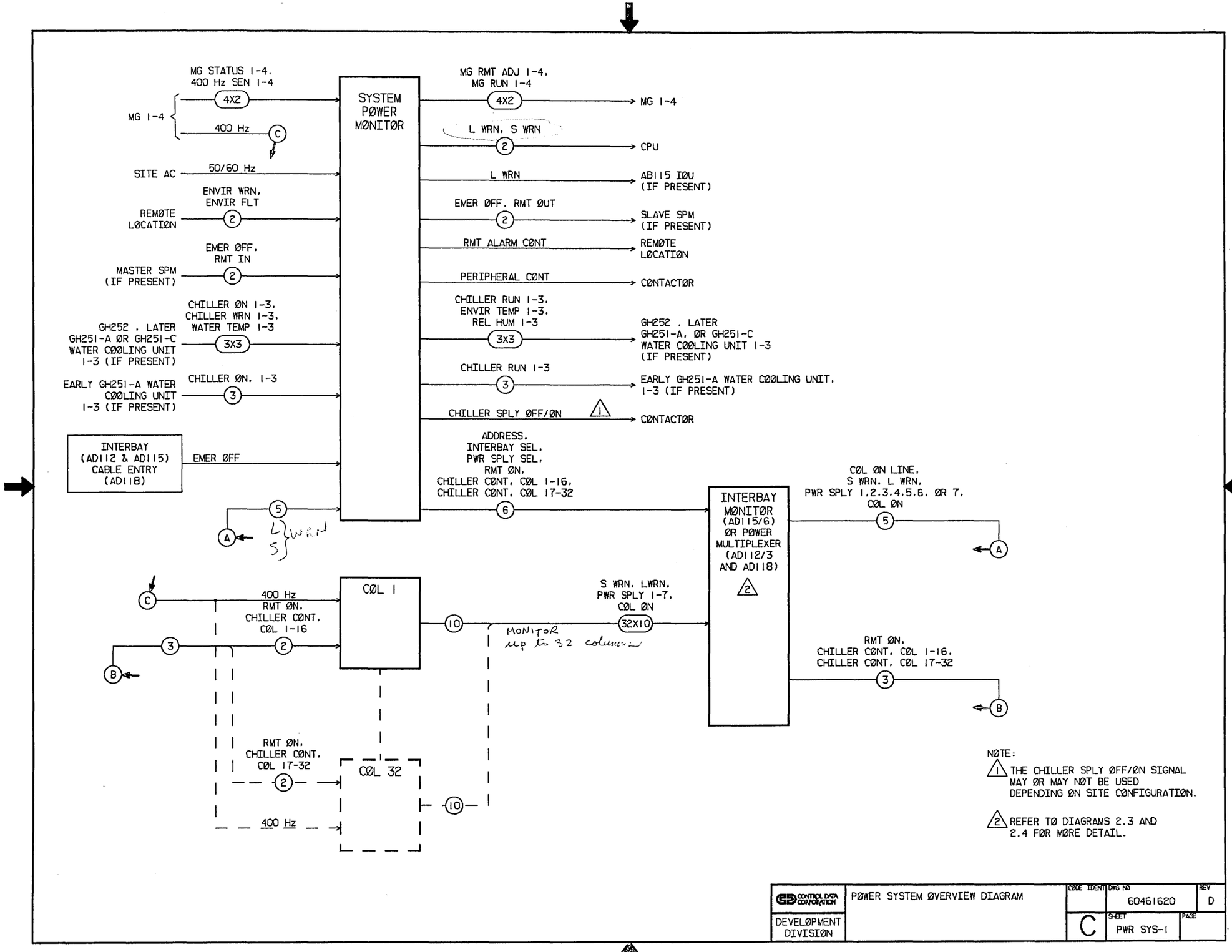
Table 5-1. Signal Description (Sheet 1 of 2)

Signal Name	Description
M-G Status 1-4	Indicates that remote control power for the related MG is on.
400 Hz Sen 1-4	Sample of related M-G output. Drives fault and display circuits in SPM.
M-G Run, 1-4	50/60-Hz power for the related M-G remote control. Under firmware control.
M-G RMT ADJ 1-4	Causes related M-G output to vary by + or - 5%.
Envir WRN, Envir FLT	Indicate room temperature, relative humidity, and dewpoint.
Emer Off	Causes power-down of SPM and all equipment it controls when unit emergency-off switch is activated.
Emer Off (from Master SPM)	Causes SPM and all equipment it controls to power-down when operating from master SPM.
Emer Off (to Slave SPM)	Causes slave SPM and all equipment it controls to power-down.
RMT IN	Causes system power-up from master SPM if operator controls are set properly.
RMT OUT	Causes power-up of slave SPM when power-up function is performed if operator controls are properly set.
Chiller On 1-3	Indicates that the related water cooling unit is power-on/off.
Chiller WRN 1-3	Indicates low temperature or low water level in related water cooling units. Used with GH252-A, later GH251-A, and GH251-C.
Water Temp 1-3	Indicates condensation on related water cooling unit output manifold. Used with GH252-A, later GH251-A, and GH251-C.
Chiller Run 1-3	Causes related water cooling unit to power-off/on. Under firmware control.
Envir Temp 1-3	Analog signal generated by sensor in SPM.†
Rel Hum 1-3	Analog signal generated by sensor in SPM.†

†The Environmental Temperature, 1-3 and Relative Humidity, 1-3 analog signals provide a means for GH252-A water cooling units to control water temperature.

Table 5-1. Signal Description (Sheet 2 of 2)

Signal Name	Description
S WRN (Short Warning)	Indicates that a fault condition exists and that power-off may occur approximately 2.5 seconds after Short Warning activates.
L WRN (Long Warning)	Indicates that a fault condition exists and that power-off may occur approximately five seconds to two minutes after Long Warning activates. Activates Short Warning when timed-out.
RMT Alarm Cont	Controls remote alarm when present.
Peripheral Cont	Removes/applies peripheral supply power. Under firmware control.
Address	Eight-bit word which controls polling of column status.
Interbay Select	Address word is valid during time that Interbay Select is active.
PWR SPLY SEL	Latches power supply polling addresses into decoder circuit in interbay monitor or power multiplexer.
RMT On	Removes/applies column power. Under firmware control. Goes from SPM through interbay monitor or power multiplexer to the columns.
Chiller Cont, Col 1-16	Removes power from columns 1 through 16 when a fault occurs. Goes from SPM through interbay monitor or power multiplexer to the columns.
Chiller Cont, Col 17-32	Removes power from columns 17 through 32 when a fault occurs. Goes from SPM through interbay monitor to the columns.
PWR SPLY 1-7	Logic power supply outputs polled by SPM.
Col On	Indicates that 400-Hz input is or is not applied to the column power supplies.
Col On Line	Indicates the cable containing a column's status signals is connected to the interbay monitor or power multiplexer.


MG STATUS 1-4,
400 Hz SEN 1-4
MG 1-4
4X2
400 Hz
C
SITE AC
50/60 Hz
ENVIR WRN,
ENVIR FLT
REMØTE
LØCATIØN
2
EMER ØFF,
RMT IN
MASTER SPM
(IF PRESENT)
2
CHILLER ØN 1-3,
CHILLER WRN 1-3,
WATER TEMP 1-3
GH252 , LATER
GH251-A ØR GH251-C
WATER CØØLING UNIT
1-3 (IF PRESENT)
3X3
CHILLER ØN, 1-3
EARLY GH251-A WATER
CØØLING UNIT
1-3 (IF PRESENT)
3
INTERBAY
(AD112 & AD115)
CABLE ENTRY
(AD118)
EMER ØFF
5
A
L WRN
S WRN
SYSTEM
PØWER
MØNITØR
MG RMT ADJ 1-4,
MG RUN 1-4
4X2
MG 1-4
L WRN, S WRN
2
CPU
L WRN
AB115 IØU
(IF PRESENT)
EMER ØFF, RMT ØUT
2
SLAVE SPM
(IF PRESENT)
RMT ALARM CØNT
REMØTE
LØCATIØN
PERIPHERAL CØNT
CØNTACTØR
CHILLER RUN 1-3,
ENVIR TEMP 1-3,
REL HUM 1-3
3X3
GH252 , LATER
GH251-A, ØR GH251-C
WATER CØØLING UNIT 1-3
(IF PRESENT)
CHILLER RUN 1-3
3
EARLY GH251-A WATER CØØLING UNIT,
1-3 (IF PRESENT)
CHILLER SPLY ØFF/ØN
1
CØNTACTØR
ADDRESS,
INTERBAY SEL,
PWR SPLY SEL,
RMT ØN,
CHILLER CØNT, CØL 1-16,
CHILLER CØNT, CØL 17-32
6
INTERBAY
MØNITØR
(AD115/6)
ØR PØWER
MULTIPLEXER
(AD112/3
AND AD118)
2
CØL ØN LINE,
S WRN, L WRN,
PWR SPLY 1,2,3,4,5,6, ØR 7,
CØL ØN
5
A
RMT ØN,
CHILLER CØNT, CØL 1-16,
CHILLER CØNT, CØL 17-32
3
B
C
400 Hz
RMT ØN,
CHILLER CØNT,
CØL 1-16
2
3
B
CØL 1
10
S WRN, LWRN,
PWR SPLY 1-7,
CØL ØN
32X10
MONITOR
up to 32 columns
RMT ØN,
CHILLER CØNT,
CØL 17-32
2
CØL 32
10
400 Hz
NØTE:
1 THE CHILLER SPLY ØFF/ØN SIGNAL MAY ØR MAY NØT BE USED DEPENDING ØN SITE CØNFIGURATIØN.
2 REFER TØ DIAGRAMS 2.3 AND 2.4 FØR MØRE DETAIL.
CONTROL DATA CORPORATION
DEVELØPMENT DIVISIØN
PØWER SYSTEM ØVERVIEW DIAGRAM
CODE IDENT
C
DWG NØ
60461620
REV
D
SHEET
PWR SYS-1
PAGE

SYSTEM POWER MONITOR

The System Power Monitor Diagram (SPM-0.1) shows internal power supplies and circuitry for control of system MGs, water cooling units, columns, peripherals, and for fault protection. Refer to diagrams SPM-0.2 and SPM-1 through SPM-10 for additional SPM-related power information.

SPM Internal Power Distribution

The SPM power distribution circuitry converts 115/220/240-V, 50/60-Hz ac input to dc power for the emergency-off circuit and for internal housekeeping. The power distribution circuit breakers, transformers, rectifiers, etc. are mounted in the cabinet and on the control board. 115 V, 50/60-Hz ac powers the cabinet blowers, the temperature/humidity recorder outlet, and the internal power supplies. If the input ac is 220/240-V ac, a step down transformer (T1) converts this to 115-V ac. 115-V ac goes to the IO board where it powers a 22-V dc supply for the emergency-off circuit. The normally closed K8B contacts of the emergency-off relay pass 115-V ac (if the emergency-off switch is not activated) to CB2. From CB2, 115-V ac goes through the normally closed STOP switch to T2. T2 generates 18-V ac which powers $\pm$ 24-V, $\pm$ 12-V, and $\pm$ 5-V dc housekeeping supplies. The System Disconnect switch removes 50/60-Hz ac for maintenance. 400-Hz input to the IO board powers the 22-V emergency-off supply in addition to 50/60 Hz.

SPM Control

Control functions include configuration, power application/removal, reset, emergency-off, and remote adjust. A local or remote manual start function initiates power application and generates a reset pulse. The microcomputer then sequentially applies power to the system components.

SPM Configuration

Dual inline package (DIP) switches SN1, SN2, and SN3 provide a means to configure the SPM according to site requirements. SN2 allows water cooling unit (chiller) selection, M-G selection, and fault indicator latch selection. SN1 and SN3 configure the fault circuitry. Tables 5-2, 5-3, and 5-4 describe the DIP switches. Refer to the installation and checkout manual listed in the preface for information on setting the DIP switches.

Table 5-2. Water Cooling Unit and M-G Selection

Switch	Description (Switch On/Closed)
SN2-1	Selects M-G 1
SN2-2	Selects M-G 2
SN2-3	Selects M-G 3
SN2-4	Selects M-G 4
SN2-5	Selects Water Cooling Unit 1
SN2-6	Selects Water Cooling Unit 2
SN2-7	Selects Water Cooling Unit 3
SN2-8	Fault Latch - When set to ON, switch permits SPM to latch fault indicator lights on SPM until HORN DISABLE switch is pressed. When set to OFF, faults are memory latched and are displayed when switch is set to ON. Pressing HORN DISABLE switch removes memory latch.

Table 5-3. Fault Configuration

Switch	Function	Description (Switch On)
SN1-1†	M-G Margin	Enables function which checks for the voltage of any phase of any selected MG outside the range of 96-V through 144-V ac.
SN1-2†	Room Temp Margin	Enables function which checks for room temperature outside a range of 12.2 °C through 32.2 °C (54 °F through 90 °F).
SN1-3†	Dewpoint Margin	Enables function which checks for room dewpoint outside a range of -17.8 °C through 13.3 °C (0 °F through 56 °F).
SN1-4†	Relative Humidity Margin	Enables function which checks for relative humidity outside a range 20% through 70%.
SN1-5†	Column Voltage Margin	Enables function which checks any column logic power supply voltage outside a range of 90% to 110%.
SN1-6†	Water Cooling Unit Water Margin	Enables function which checks for any water cooling unit water temperature outside a range of 0 °C through 26.7 °C (32 °F through 80 °F).
SN1-7	Column Off	Enables a function which activates the remote alarm if any column does not have power applied.
SN1-8	Remote Alarm	Enables remote alarm for Long Warning and Short Warning (except Long Warning associated with SN1 functions).

†When margins are exceeded, the appropriate fault indicator lights, the local horn sounds, and Long Warning activates. The system takes no action if the switch is off.

Table 5-4. Fault, Meter, and Remote Configurations

Switch	Function	Description (Switch On)
SN3-1	Environmental Warning (External Sensor)	When set to OFF, if dewpoint is sensed, TEMP, DEW and R/H indicators light, local horn sounds, remote alarm activates, and Long Warning activates.
SN3-2†	Environmental Fault (External Sensor)	When set to OFF, If dewpoint is sensed, TEMP, DEW and R/H indicators light, local horn sounds, remote alarm activates, and Short Warning activates.
SN3-3† ††	Dewpoint Fault	When set to OFF, If dewpoint is greater than 14 °C (58 °F) DEW indicator lights, local horn sounds, remote alarm activates, and Short Warning activates.
SN3-4†	Room Temp Fault	When set to OFF, If room temperature exceeds 40 °C (104 °F), TEMP indicator lights, local horn sounds, remote alarm activates, and Short Warning activates.
SN3-5†	Relative Humidity Fault	When set to OFF, If relative humidity exceeds 96%, R/H indicator lights, local horn sounds, remote alarm sounds, and Short Warning activates.
SN3-6	Programmed Power-Off	When set to ON, enables the programmed power-off function for the enabled functions associated with SN3-2, 3, 4, and 5.
SN3-7	Meter Disable	When set to ON, disables meter for test purposes.
SN3-8 SN3-9	180 Remote On 180 Remote Short Warning	Set to ON when equipment does not connect to J5 and J6 on bottom of SPM, (enables remote on circuit for use with models 815, 825, 835, 845, or 855 equipment). Set to OFF when equipment does not connect to J5 and J6 (must be disabled when this equipment is not used). OFF enables, ON disables.

†If SN3-6 is on, system power is removed.
††Must be on when condenser-cooled equipment is used.

SPM Initiation Of Power Application

Power application of the SPM can be initiated locally or by one of several remote modes. The remote modes are remote 1A, remote 1B, remote 2, and remote 3. Each mode activates the start, run, and ride-through relays. After this, the microcomputer controls a sequential system power-up.

SPM Local Mode: Setting key switch S1 to LOCAL causes S1B to apply a signal to the microcomputer. This signal indicates that the power-up mode is LOCAL. Pressing the LOCAL START/REMOTE ENABLE switch resets the K5 fault relay and energizes the K4 start relay via the Start signal from key switch S1D. Refer to Start, Run, and Ride-Through Relays in following text for a description of start relay operation.

SPM Remote 1A and Remote 1B Modes: Pressing the LOCAL START/REMOTE ENABLE switch resets relay K5 in the control board (required before remote on function). Setting key switch S1 to Remote 1 causes S1B to apply a Remote 1 signal to the microcomputer. In Remote 1A operation, K9 on the IO board energizes via a Remote 1A signal (120-V ac) ac from a master SPM. The K9 contacts close and generate Remote Control 1 In. In Remote 1B operation, a RMT In signal (contact closure at a master SPM) generates Remote Control 1 In. Remote Control 1 In generates Start via key switch S1D. Start energizes the K4 start relay on the control board. Refer to Start, Run, and Ride-Through Relays in following text for a description of start relay operation. Pressing the STOP switch removes 50/60-Hz power and prevents remote on.

SPM Remote 2 Mode: Pressing the LOCAL START/REMOTE ENABLE switch resets relay K5 in the control board (required before remote on function). Setting key switch S1 to Remote 2 causes S1B to apply the Remote 2 signal to the microcomputer and S1C to enable Remote 2 Short Warning to the cabinets. Remote 2 Short Warning may or may not be used depending on system configuration. Remote Control 2 in from the master SPM generates Start via key switch S1D. Start energizes the K4 Start Relay. Refer to Start, Run, and Ride-Through Relays in following text for a description of start relay operation. Pressing the STOP switch removes 50/60-Hz power and prevents remote on.

SPM Remote 3 Mode: Remote 3 mode is not currently used.

SPM Start, Run, and Ride-Through Relays: A Start signal generated by a local or remote power application function energizes the K4 Start Relay if the K5 Fault Relay is in reset mode (no faults exist). An energized K4 energizes the K6 Run Relay. In CYBER 170 systems, the Start signal generated by K4 goes through the system cabinets and returns to energize K6. In CYBER 180 systems, K4 energizes K6 via SN3-8. If K6 is energized:

- Contacts K6A energize the K7 ride-through relay.
- Contacts K6B start the front panel time meter.
- Contacts K6C open and remove the initialize signal from the microcomputer.
- Contacts K6D apply 5-V dc internal power.

If K7 is energized, contacts K7A close and ground Local Start/Remote Enable, thus holding K4 energized. In remote power application modes, jumper plugs connect the Local Start/Remote Enable line to the K4 coil allowing K7A to ground the line. A capacitor across the K4 coil holds K7 energized for approximately 2.5 seconds when 50/60-Hz disruptions occur. This allows K4 to reenergize if 50/60-Hz stabilizes within approximately 2.5 seconds and if K5 is in Reset Mode.

SPM System Power Application Sequence

After K6C contacts remove the reset signal, the microcomputer starts a system power application sequence. During this sequence, the microcomputer:

1. Generates the Chiller Supply Off/On signal on the IO board which activates the water cooling unit contactor (if required) and sends Short Warning to the CPU. Some systems are configured so that activation of the water cooling unit contactor is not necessary.

2. Generates the Chiller Run signal which causes the GH251-A/-C water cooling units (if present) to receive power.

3. Generates the Chiller Run A 1-3 signals on the control board as required. Only the signals selected by switch SN2 activate and cause the corresponding GH252-A water cooling units (if present) to receive power.

4. Checks the M-G sets. If running, the sequence jumps to step 10.

5. Generates M-G Run 1 (120-V ac) which supplies motor power to M-G 1 (if present).† †† After approximately one minute, 400-Hz power is available from M-G 1.

6. Generates the Column Remote On, Peripheral Control, and Remote Control 1B signals. Columns and peripherals supplied by M-G 1 then receive power. The Peripheral Control signal activates the peripheral supply contactor. Remote Control 1B activates a slave SPM (if present).

7. Generates the M-G Run 2 signal (120-V ac) causing power to the M-G 2 motor (if present).† †† After approximately one minute, the columns and peripherals supplied by M-G 2 receive power.

8. Generates the M-G Run 3 signal (120-V ac) causing power to the M-G 3 motor (if present).† After approximately one minute, the columns and peripherals supplied by M-G 3 receive power.

9. Generates the M-G Run 4 signal (120-V ac) causing power to the M-G 4 motor (if present).† After approximately one minute, the columns and peripherals supplied by M-G 4 receive power.

10. Removes Short Warning from the CPU.

One-second intervals occur between the power application steps. After power application, the microcomputer sequentially polls the MGs, water cooling units, and columns for status.

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†Only the M-G Run signals selected by switch SN2 activate. The MGs corresponding to the SN2 settings receive power in sequence from the lowest to the highest designation number.

††M-G 1 or M-G 2 is required for the emergency-off circuits to function.

SPM Normal Power Removal

A local or remote stop function initiates system power removal and the microcomputer deenergizes the following relays:

- K3 RMT On relay on the control board.
- K1, K2, K3, and K4 M-G relays on the IO board.
- K5, K6, and K7 chiller relays on the IO board.
- K7 peripheral relay on the IO board.

The power removal sequence is the reverse of the power application sequence. That is, columns and peripherals lose power first, then the M-G sets, and finally the water cooling units.

SPM Fault Power Removal

SPM Temperature, SPM Relative Humidity, SPM Dewpoint, and Environmental Fault, if enabled, can cause power removal if the fault power removal function is enabled (SN3-6 closed). Faults are described under Fault Signals and Functions in this section. The microcomputer monitors fault conditions and initiates power removal by setting the K5 programmed power-off relay to the power-off mode. This deenergizes the K4 start relay followed by the K6 run relay, followed in turn, by the K7 ride-through relay. K6 deenergizing causes removal of + 5-V from the microcomputer and application of the Initialize signal to the microcomputer. This opens the column, peripheral, MG, and chiller relays and removes system power. For a fault power-down, the K8 column 1-16 off or K9 column 17-32 off relay removes column power depending on where the fault occurred. A reset function must follow a fault power-down to allow subsequent power-up.

SPM Emergency-Off

The emergency-off circuit provides a means to quickly remove power in case of emergency. Plus 22-V dc goes through normally closed relay contacts in the master SPM, (if present) and through the normally closed UNIT EMERGENCY OFF switch on an interbay or cable entry cabinet. This keeps the K8 emergency-off relay energized during operation. If the relay contacts in a master SPM open or the UNIT EMERGENCY-OFF switch opens, the K8 emergency-off relay deenergizes, and contacts K8B remove power to the internal power supplies on the control board. Thus, the SPM and all equipment controlled by the SPM powers-down. More than one UNIT EMERGENCY-OFF switch can be connected in series if the system has more than one interbay or cable entry cabinet. The relay contacts in a master SPM or the UNIT EMERGENCY-OFF switch must close before power-up is possible. If a master SPM is not present, an appropriate jumper must be in place to provide continuity for + 22-V to the K8 relay coil. Contact K8A powers-down a slave SPM (if present) during a unit emergency-off. The 22-V dc used for emergency-off derives from 50/60-Hz and 400-Hz. The K8 emergency-off relay energizes when 50/60-Hz is applied. 400-Hz keeps the 22-V up and the K8 relay energized during momentary 50/60-Hz disruptions.

A room emergency-off system can also remove power from the SPM and its associated equipment by removing the 50/60-Hz input power.

SPM Reset

Pressing the LOCAL START/REMOTE ENABLE switch resets K5 when system power removal is the result of a fault. This allows system power application after clearing the fault.

SPM Remote Adjust

Four potentiometers on the IO board allow adjustment of each M-G output by ± 5%. These potentiometers are accessible from the front panel.

SPM Protection

The microcomputer continuously polls the columns, MGs, and water cooling units for fault conditions. Some fault circuits in the SPM are always active, others are enabled or disabled by the SN1 and SN3 DIP switches. Active fault circuits enable a local alarm system upon fault detection. This means the microcomputer:

- Sends Long Warning to the AB115-A IOU, if present.
- Sends Long Warning or Short Warning to the CPU depending on the fault condition and on whether certain limits are exceeded.
- Activates the appropriate SPM fault indicator.
- Activates the local horn.

A remote audio or visual alarm activates (if present) and if enabled (SN1-8 closed) when active circuits detect a fault. Certain faults, if enabled, cause the microcomputer to remove power if this function is enabled (SN3-6 closed). The following text describes fault signals and functions.

NOTE

AB115-A IOU does not connect to the SPM protection system.

SPM Fault Signals and Functions

Chiller On 1-3 - Lights the appropriate SPM CHILLER ON indicator when the related water cooling unit has power applied. If a unit is not on, the local horn sounds and Long Warning goes to the CPU.

Chiller WRN 1-3 (GH252-A) - Lights the CHILLER FAULT indicator and sounds the local horn if chiller has a high pressure, low temperature, or high/low level fault.

Water Temp 1-3 - If SN1-6 is on, lights CHILLER FAULT indicator and sounds local horn when related water cooling unit output water temperature is less than 0 °C (32 °F) or greater than 27 °C (80 °F). Long Warning goes to the CPU. Applies only to water cooling units connected to control board.

L WRN (from columns) - Activates COLUMN FAULT light and local horn when dew forms on input water line to column. Long Warning goes to the CPU.

S WRN (from columns) - Activates COLUMN FAULT light and local horn when a back-up high temperature fault occurs at a column. Short warning goes to the CPU.

RMT On - Lights appropriate SPM COLUMN ON indicator when related column has power applied. A remote indicator activates (if present) when S1-7 is closed regardless of whether S1-8 is open or closed.

Column On Line (from columns) - Activates when cable to interbay monitor or power multiplexer is not connected. Activates a remote audio or visual indicator (if present) when S1-7 is closed regardless of whether S1-8 is open or closed. No fault indicator lights and the local horn does not sound.

PWR SPLY 1, 2, 3, 4, 5, 6, or 7 (from columns)† - Lights COLUMN FAULT indicator (if S1-5 is closed) when power supplies are less than 90% or greater than 110% of nominal. Long Warning goes to the CPU and the local horn sounds.

400-Hz Sen 1-4 - Sounds local horn and causes Short Warning when there is loss of power to M-G motor. If SN1-7 is on, remote alarm activates. If SN1-1 is on, sounds local horn when M-G output is less than 96-V or greater than 142-V. Long Warning goes to the CPU. The SPM MG ON indicator lights when 400-Hz is over 75-V.

MG Status 1-4 - Indicates that remote control power for the related M-G is on.

SPM Temp - Activates TEMP light and local horn (if SN1-2 is closed) when temperature at SPM is less than 12 °C (54 °F) or greater than 34 °C (90 °F). Long Warning goes to the CPU. If SN3-4 is on and temperature exceeds 40 °C (104 °F), the local and remote alarms activate and Short Warning goes to the CPU. If SN3-6 is on, system power is removed. Refer to Fault Power Removal in preceding text.

SPM Rel Hum - Activates RH light and local horn (if SN1-4 is closed) when relative humidity is less than 20% or greater than 70%. Long Warning goes to the CPU. If SN3-5 is on and relative humidity exceeds 96%, the local and remote alarms activate and Short Warning goes to the CPU. If SN3-6 is on, system power is removed. Refer to Fault Power Removal in preceding text.

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†Refer to the Interbay Monitor Board Diagram (INB MON-1) and the Power Multiplexer Board Diagram (PWR MUX-1) for power supply voltages and relationship to equipment units.

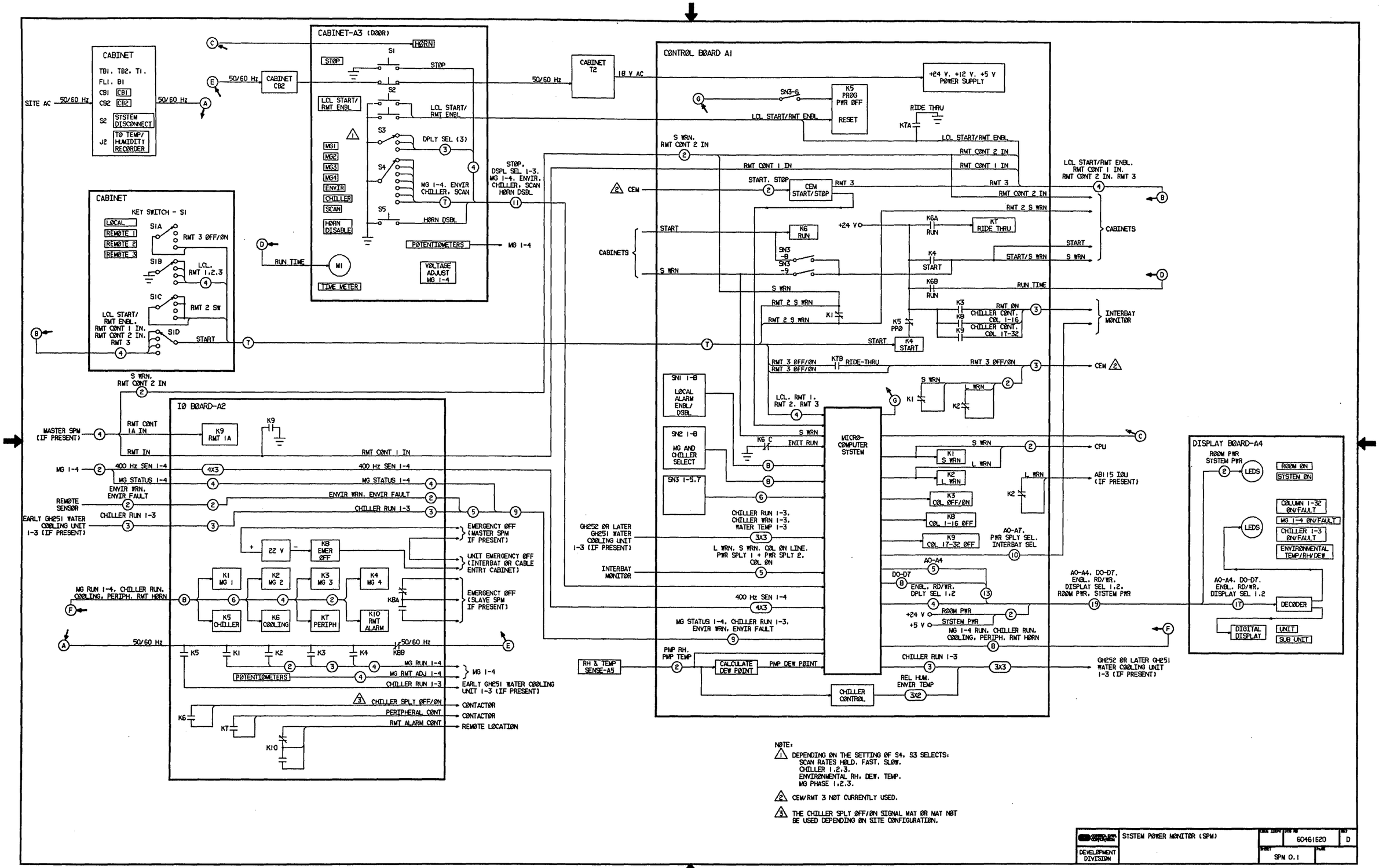
SPM Dewpoint - Activates DEW light and local horn (if SN1-3 is closed) when the dewpoint is less than -22 °C (0 °F) or greater than 13 °C (56 °F). Long Warning goes to the CPU. If SN3-3 is on and dewpoint exceeds 14 °C (58 °F), the local and remote alarms activate and Short Warning goes to the CPU. If SN3-6 is closed, system power is removed. Refer to Fault Power Removal in preceding text.

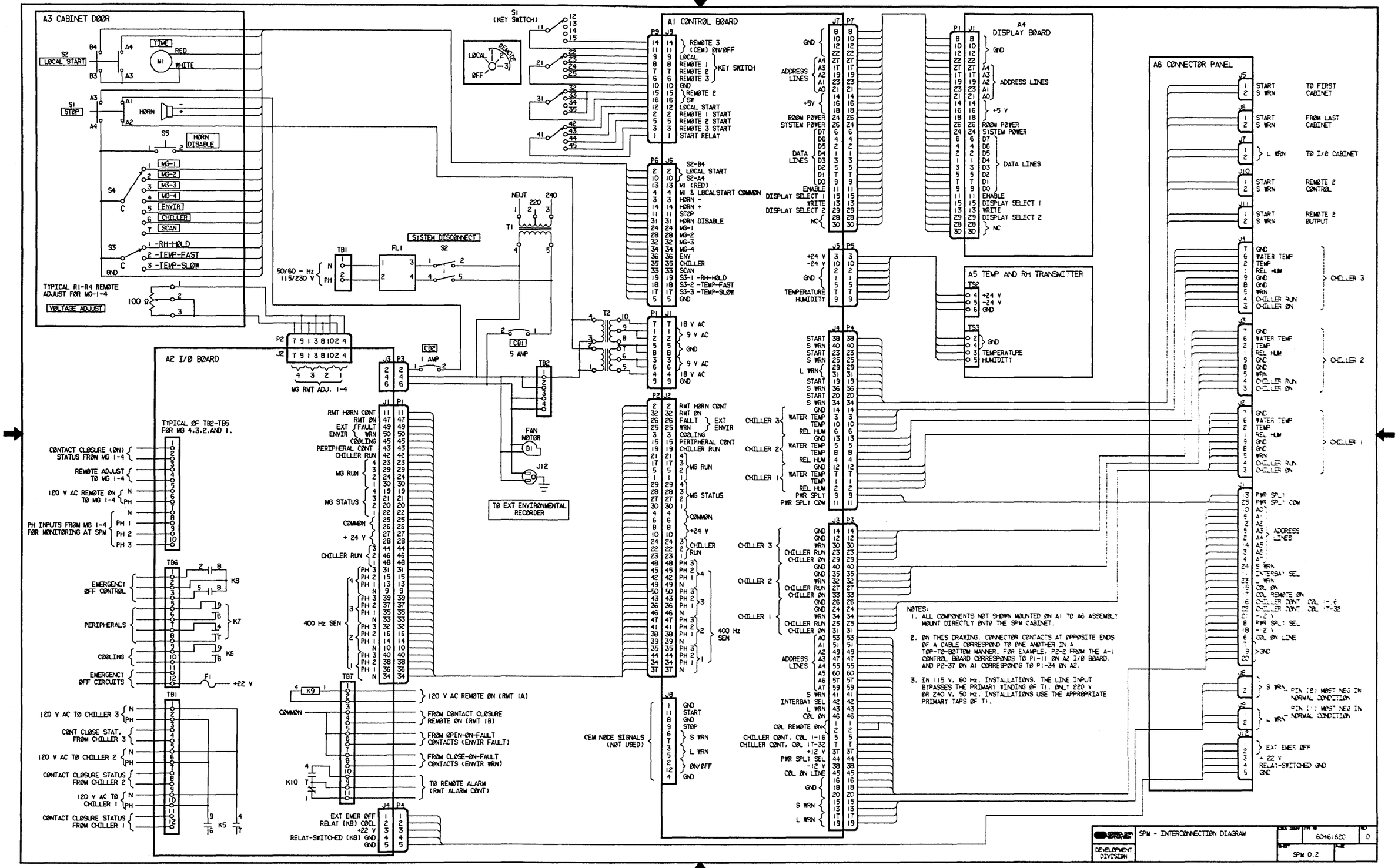
Environmental Warning - Provides a warning input for an external dewpoint sensor. If SN3-1 is on, the TEMP, RH, and DEW indicators light and the local and remote alarms activate when external condition goes beyond a predefined limit. Long Warning goes to the CPU.

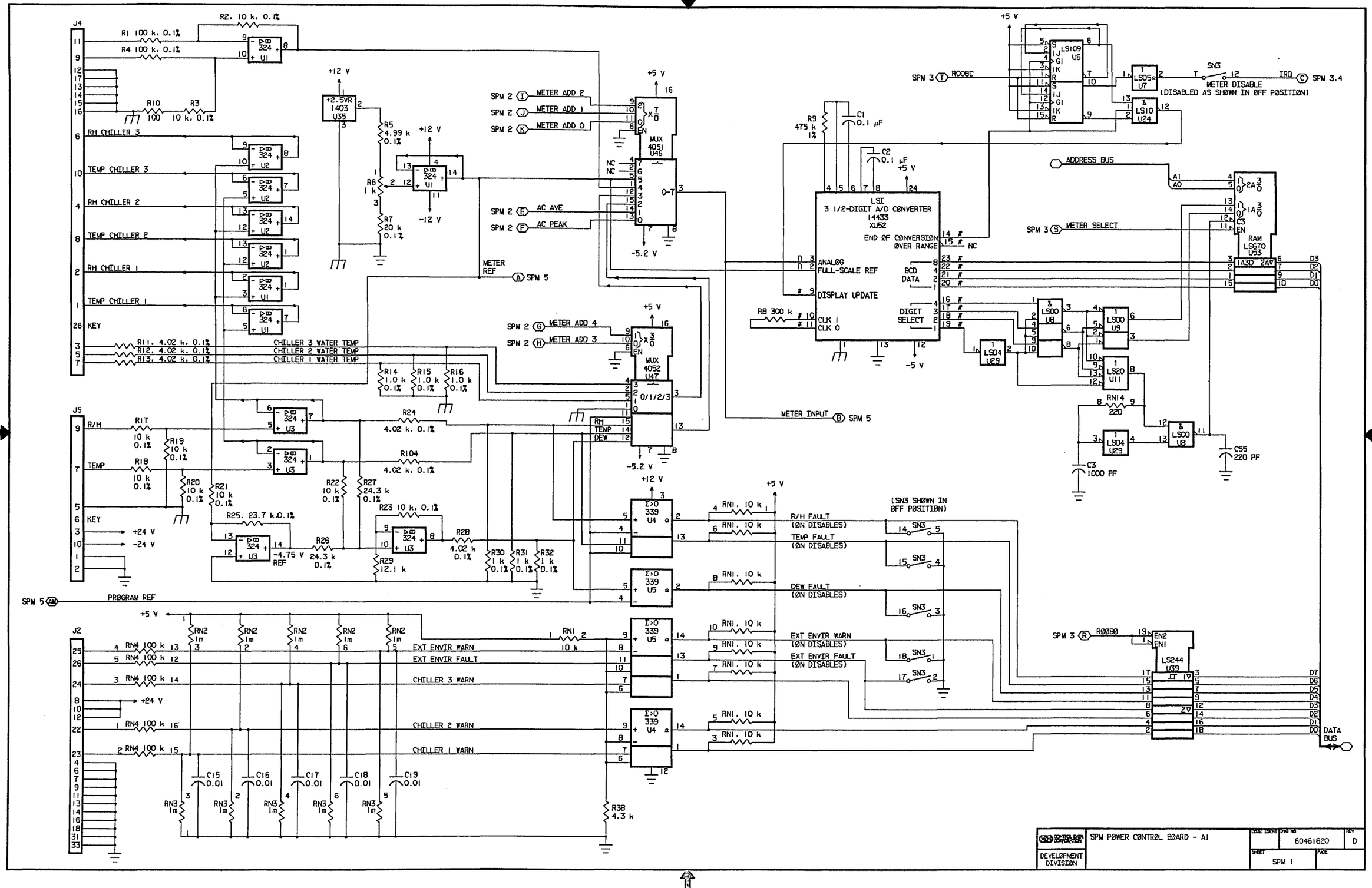
Environmental Fault - Provides a fault input for an external dewpoint sensor. If SN3-2 is on, the TEMP, RH, and DEW indicators light and the local and remote alarms activate when external condition goes beyond a predefined limit. Short Warning goes to the CPU. If SN3-6 is on, system power is removed. Refer to Fault Power Removal in preceding text.

SPM Display

The SPM front panel display shows system status and is under control of the microcomputer except ROOM ON and SYSTEM ON. ROOM ON and SYSTEM ON are analog-driven. Other status information goes to the display via the D0 through D7 data signals from the microcomputer. The A0 through A4 address signals and the Enable, Read/Write, and Display Select signals control display operation.

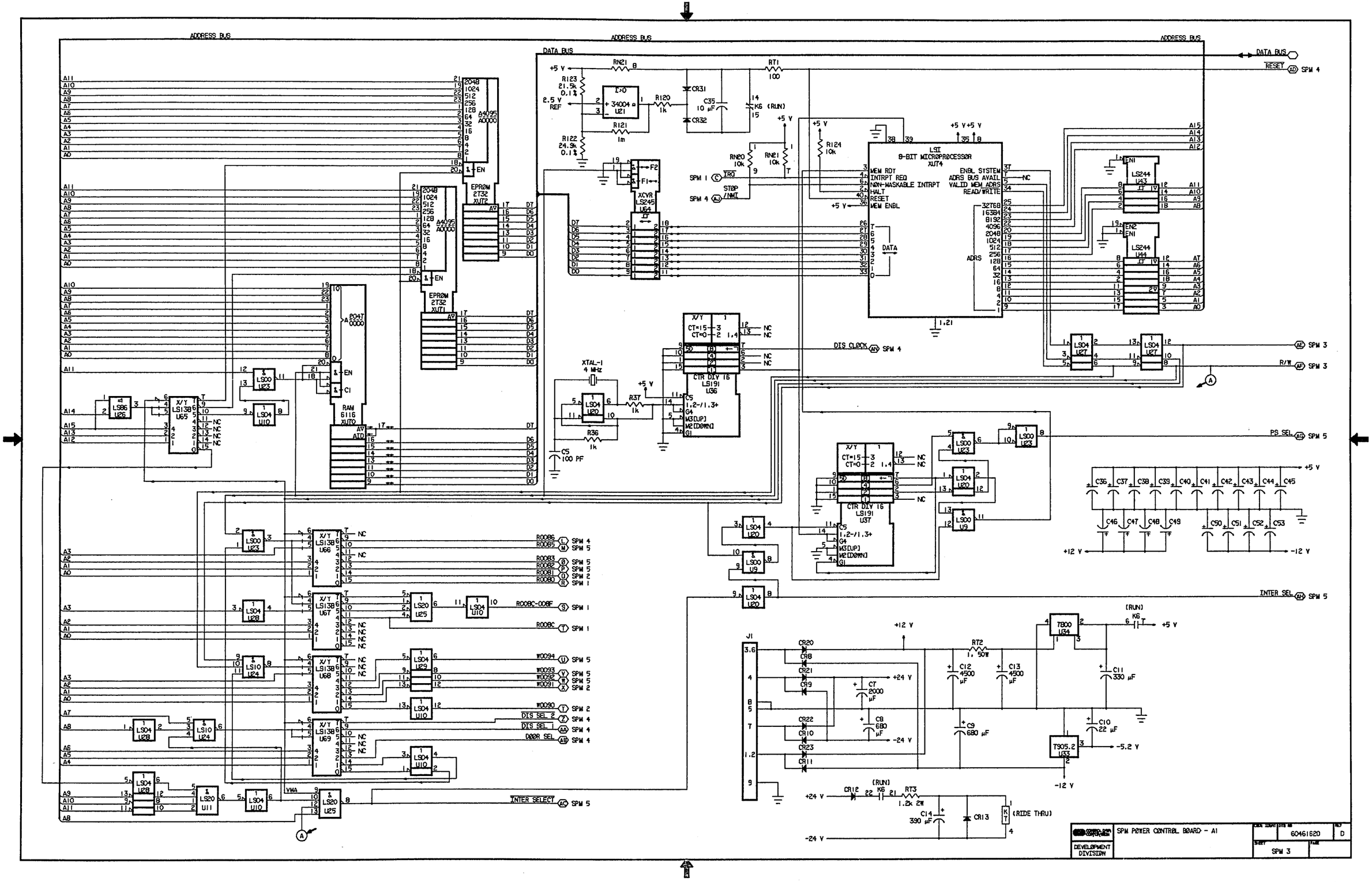

CABINET
TB1, TB2, T1,
FL1, B1
CB1 CB1
CB2 CB2
S2 SYSTEM DISCONNECT
J2 TO TEMP/HUMIDITY RECORDER
SITE AC 50/60 Hz
50/60 Hz
CABINET CB2
CABINET-A3 (DOOR)
HORN
STOP
S1
S2
LCL START/RMT ENBL
S3
DPLY SEL (3)
S4
MG 1-4, ENVIR CHILLER, SCAN
S5
HORN DSBL
MG1
MG2
MG3
MG4
ENVIR
CHILLER
SCAN
HORN DISABLE
TIME METER
M1
RUN TIME
POTENTIOMETERS
VOLTAGE ADJUST MG 1-4
MG 1-4
CABINET T2
18 V AC
50/60 Hz
CONTROL BOARD A1
+24 V, +12 V, +5 V POWER SUPPLY
SW3-6
K5 PROG PWR OFF RESET
RIDE THRU
K7A
LCL START/RMT ENBL
S WRN, RMT CONT 2 IN
RMT CONT 1 IN
RMT CONT 2 IN
START, STOP
CEM START/STOP
RMT 3
CEM
LCL START/RMT ENBL, RMT CONT 1 IN, RMT CONT 2 IN, RMT 3
CABINETS
START
S WRN
K6 RUN
+24 VO
K6A RUN
K7 RIDE THRU
SW3-8
SW3-9
K4 START
START/S WRN
RMT 2 S WRN
K6B RUN
RUN TIME
K1
K3 RMT ØN
K8 CHILLER CONT. COL 1-16
K9 CHILLER CONT. COL 17-32
INTERBAY MONITOR
K5 PPØ
K4 START
RMT 3 ØFF/ØN
K7B RIDE-THRU
CEM
LCL, RMT 1, RMT 2, RMT 3
K1
K2
L WRN
SW1 1-8 LOCAL ALARM ENBL/DSBL
SW2 1-8 MG AND CHILLER SELECT
SW3 1-5,7
K6 C INIT RUN
MICRO-COMPUTER SYSTEM
CPU
ABI15 I/O (IF PRESENT)
K3 COL ØFF/ØN
K8 COL 1-16 ØFF
K9 COL 17-32 ØFF
AO-A7, PWR SPLY SEL, INTERBAY SEL
AO-A4
DISPLAY BOARD-A4
ROOM PWR SYSTEM PWR
LEDS
ROOM ØN
SYSTEM ØN
COLUMN 1-32 ØN/FAULT
MG 1-4 ØN/FAULT
CHILLER 1-3 ØN/FAULT
ENVIRONMENTAL TEMP/RH/DEW
DECODER
DIGITAL DISPLAY
UNIT
SUB UNIT
AO-A4, DO-D7, ENBL, RD/WR, DPLST SEL 1,2, ROOM PWR, SYSTEM PWR
DO-D7
ENBL, RD/WR, DPLY SEL 1,2
+24 V
+5 V
ROOM PWR
SYSTEM PWR
MG 1-4 RUN, CHILLER RUN, COOLING, PERIPH, RMT HORN
CHILLER RUN 1-3
REL HUM, ENVIR TEMP
3X2
3X3
GH252 OR LATER GH251 WATER COOLING UNIT 1-3 (IF PRESENT)
CABINET
KEY SWITCH - S1
LOCAL
REMOTE 1
REMOTE 2
REMOTE 3
S1A
RMT 3 OFF/ON
S1B
LCL, RMT 1,2,3
S1C
RMT 2 SW
S1D
START
LCL START/RMT ENBL, RMT CONT 1 IN, RMT CONT 2 IN, RMT 3
S WRN, RMT CONT 2 IN
I/O BOARD-A2
MASTER SPM (IF PRESENT)
RMT CONT 1A IN
RMT IN
K9 RMT 1A
RMT CONT 1 IN
MG 1-4
400 Hz SEN 1-4
MG STATUS 1-4
ENVIR WRN, ENVIR FAULT
REMOTE SENSOR
CHILLER RUN 1-3
EARLY GH251 WATER COOLING UNIT 1-3 (IF PRESENT)
EMERGENCY OFF (MASTER SPM IF PRESENT)
UNIT EMERGENCY OFF (INTERBAY OR CABLE ENTRY CABINET)
EMERGENCY OFF (SLAVE SPM IF PRESENT)
22 V
K8 EMER OFF
K1 MG 1
K2 MG 2
K3 MG 3
K4 MG 4
K8A
K5 CHILLER
K6 COOLING
K7 PERIPH
K10 RMT ALARM
MG RUN, CHILLER RUN, COOLING, PERIPH, RMT HORN
50/60 Hz
K8B
MG RUN 1-4
MG RMT ADJ 1-4
POTENTIOMETERS
EARLY GH251 WATER COOLING UNIT 1-3 (IF PRESENT)
CHILLER SPLY ØFF/ØN
CONTACTOR
PERIPHERAL CONT
RMT ALARM CONT
REMOTE LOCATION
K10
RH & TEMP SENSE-A5
PMP RH, PMP TEMP
CALCULATE DEW POINT
PMP DEW POINT
CHILLER CONTROL
CHILLER RUN 1-3, CHILLER WRN 1-3, WATER TEMP 1-3
L WRN, S WRN, COL ØN LINE, PWR SPLY 1 + PWR SPLY 2, COL ØN
MG STATUS 1-4, CHILLER RUN 1-3, ENVIR WRN, ENVIR FAULT
GH252 OR LATER GH251 WATER COOLING UNIT 1-3 (IF PRESENT)
INTERBAY MONITOR
STOP, DSPL SEL 1-3, MG 1-4, ENVIR, CHILLER, SCAN HORN DSBL
NOTE:
1 DEPENDING ON THE SETTING OF S4, S3 SELECTS:
SCAN RATES HOLD, FAST, SLOW.
CHILLER 1,2,3.
ENVIRONMENTAL RH, DEW, TEMP.
MG PHASE 1,2,3.
2 CEM/RMT 3 NOT CURRENTLY USED.
3 THE CHILLER SPLY OFF/ON SIGNAL MAY OR MAY NOT BE USED DEPENDING ON SITE CONFIGURATION.
SYSTEM POWER MONITOR (SPM)
DEVELOPMENT DIVISION
60461620
D
SPM 0.1

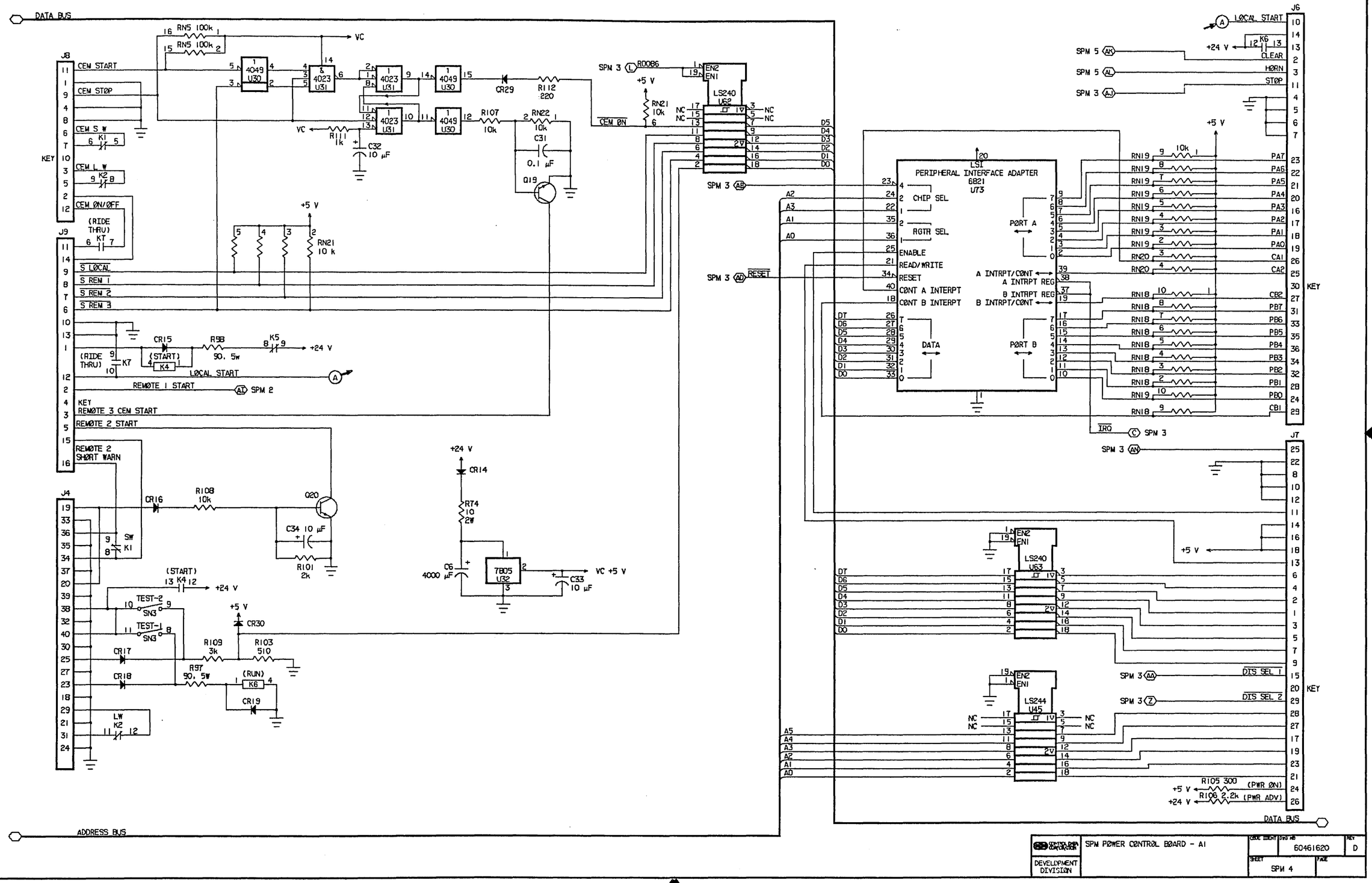

A3 CABINET DØØR
S2 LØCAL START
TIME
RED
WHITE
M1
S1 STØP
HØRN
S5 HØRN DISABLE
S4
MG-1
MG-2
MG-3
MG-4
ENVIR
CHILLER
SCAN
S3
-RH-HØLD
-TEMP-FAST
-TEMP-SLØW
GND
TYPICAL R1-R4 REMØTE ADJUST FØR MG-1-4
VØLTAGE ADJUST
100 Ω
S1 (KEY SWITCH)
LØCAL
REMØTE
ØFF
A1 CØNTRØL BØARD
REMØTE 3 (CEM) ØN/ØFF
LØCAL
REMØTE 1
REMØTE 2
REMØTE 3
KEY SWITCH
GND
REMØTE 2 SW
LØCAL START
REMØTE 1 START
REMØTE 2 START
REMØTE 3 START
START RELAY
S2-B4
LØCAL START
S2-A4
M1 (RED)
M1 & LØCALSTART CØMMØN
HØRN -
HØRN +
STØP
HØRN DISABLE
MG-1
MG-2
MG-3
MG-4
ENV
CHILLER
SCAN
S3-1 -RH-HØLD
S3-2 -TEMP-FAST
S3-3 -TEMP-SLØW
GND
A4 DISPLAY BØARD
GND
ADDRESS LINES
+5V
RØØM PØWER
SYSTEM PØWER
DATA LINES
ENABLE
DISPLAY SELECT 1
WRITE
DISPLAY SELECT 2
NC
A5 TEMP AND RH TRANSMITTER
+24 V
-24 V
GND
TEMPERATURE
HUMIDITY
A6 CØNNECTØR PANEL
START
S WRN
L WRN
TØ FIRST CABINET
FRØM LAST CABINET
TØ I/Ø CABINET
REMØTE 2 CØNTRØL
REMØTE 2 ØUTPUT
WATER TEMP
TEMP
REL HUM
CHILLER RUN
CHILLER ØN
CHILLER 3
CHILLER 2
CHILLER 1
SYSTEM DISCØNNECT
FL1
S2
T1
NEUT
220
240
50/60 - Hz 115/230 V
N
PH
TB1
CB1 5 AMP
CB2 1 AMP
T2
18 V AC
9 V AC
GND
A2 I/Ø BØARD
P2 J2
MG RMT ADJ. 1-4
J3 P3
RMT HØRN CØNT
RMT ØN
EXT FAULT
ENVIR WRN
CØØLING
PERIPHERAL CØNT
CHILLER RUN
MG RUN
MG STATUS
CØMMØN
+ 24 V
CHILLER RUN
400 Hz SEN
TB2
FAN MØTØR
B1
J12
TØ EXT ENVIRØNMENTAL RECØRDER
EXT
ENVIR
CHILLER RUN
MG RUN
MG STATUS
CØMMØN
+24 V
CHILLER RUN
400 Hz SEN
J8
GND
START
GND
STØP
CEM MØDE SIGNALS (NØT USED)
S WRN
L WRN
ØN/ØFF
GND
TYPICAL ØF TB2-TB5 FØR MG 4,3,2,AND 1.
CØNTACT CLØSURE (ØN) STATUS FRØM MG 1-4
REMØTE ADJUST TØ MG 1-4
120 V AC REMØTE ØN TØ MG 1-4
PH INPUTS FRØM MG 1-4 FØR MØNITØRING AT SPM
TB6
EMERGENCY ØFF CØNTRØL
PERIPHERALS
CØØLING
EMERGENCY ØFF CIRCUITS
KB
KT
K6
F1
+22 V
TB1
120 V AC TØ CHILLER 3
CØNT CLØSE STAT. FRØM CHILLER 3
120 V AC TØ CHILLER 2
CØNTACT CLØSURE STATUS FRØM CHILLER 2
120 V AC TØ CHILLER 1
CØNTACT CLØSURE STATUS FRØM CHILLER 1
K5
TB7
K9
K10
120 V AC REMØTE ØN (RMT 1A)
CØMMØN
FRØM CØNTACT CLØSURE REMØTE ØN (RMT 1B)
FRØM ØPEN-ØN-FAULT CØNTACTS (ENVIR FAULT)
FRØM CLØSE-ØN-FAULT CØNTACTS (ENVIR WRN)
TØ REMØTE ALARM (RMT ALARM CØNT)
J4 P4
EXT EMER ØFF
RELAY (K8) CØIL
+22 V
RELAY-SWITCHED (K8) GND
GND
CHILLER 3
CHILLER 2
CHILLER 1
WATER TEMP
TEMP
REL HUM
GND
PWR SPLY
PWR SPLY CØM
CHILLER RUN
CHILLER ØN
CØNTROL REMØTE ØN
CHILLER CØNT. CØL 1-16
CHILLER CØNT. CØL 17-32
+12 V
PWR SPLY SEL
-12 V
CØL ØN LINE
ADDRESS LINES
DATA LINES
NØTES:
1. ALL CØMPØNENTS NØT SHØWN MØUNTED ØN A1 TØ A6 ASSEMBLY MØUNT DIRECTLY ØNTØ THE SPM CABINET.
2. ØN THIS DRAWING, CØNNECTØR CØNTACTS AT ØPPØSITE ENDS ØF A CABLE CØRRESPØND TØ ØNE ANØTHER IN A TØP-TØ-BØTTØM MANNER. FØR EXAMPLE, P2-2 FRØM THE A-1 CØNTRØL BØARD CØRRESPØNDS TØ P1-11 ØN A2 I/Ø BØARD, AND P2-37 ØN A1 CØRRESPØNDS TØ P1-34 ØN A2.
3. IN 115 V, 60 Hz, INSTALLATIØNS, THE LINE INPUT BYPASSES THE PRIMARY WINDING ØF T1. ØNLY 220 V ØR 240 V, 50 Hz, INSTALLATIØNS USE THE APPRØPRIATE PRIMARY TAPS ØF T1.
SPM - INTERCØNNECTIØN DIAGRAM
DEVELØPMENT DIVISIØN
60461620
D
SPM 0.2


J4
R1 100 k, 0.1%
R2. 10 k, 0.1%
R4 100 k, 0.1%
R10 100
R3 10 k, 0.1%
RH CHILLER 3
TEMP CHILLER 3
RH CHILLER 2
TEMP CHILLER 2
RH CHILLER 1
TEMP CHILLER 1
KEY
R11. 4.02 k, 0.1%
R12. 4.02 k, 0.1%
R13. 4.02 k, 0.1%
CHILLER 3 WATER TEMP
CHILLER 2 WATER TEMP
CHILLER 1 WATER TEMP
+2.5VR 1403 U35
+12 V
R5 4.99 k 0.1%
R6 1 k
R7 20 k 0.1%
-12 V
SPM 2 (T) METER ADD 2
SPM 2 (J) METER ADD 1
SPM 2 (K) METER ADD 0
MUX 4051 U46
SPM 2 (E) AC AVE
SPM 2 (F) AC PEAK
METER REF
(A) SPM 5
-5.2 V
SPM 2 (G) METER ADD 4
SPM 2 (H) METER ADD 3
MUX 4052 U47
R14 1.0 k 0.1%
R15 1.0 k 0.1%
R16 1.0 k 0.1%
RH
TEMP
DEW
METER INPUT (B) SPM 5
J5
R/H
TEMP
KEY
R17 10 k 0.1%
R18 10 k 0.1%
R19 10 k 0.1%
R20 10 k 0.1%
R21 10 k 0.1%
+24 V
-24 V
R24 4.02 k. 0.1%
R104 4.02 k. 0.1%
R22 10 k 0.1%
R27 24.3 k 0.1%
R23 10 k, 0.1%
R25. 23.7 k.0.1%
R26 24.3 k 0.1%
-4.75 V REF
R28 4.02 k 0.1%
R29 12.1 k
R30 1 k 0.1%
R31 1 k 0.1%
R32 1 k 0.1%
R38 4.3 k
SPM 5 (AM) PROGRAM REF
J2
RN4 100 k
EXT ENVIR WARN
EXT ENVIR FAULT
CHILLER 3 WARN
CHILLER 2 WARN
CHILLER 1 WARN
RN1 10 k
RN2 1m
RN3 1m
C15 0.01
C16 0.01
C17 0.01
C18 0.01
C19 0.01
+5 V
R9 475 k 1%
C1 0.1 µF
C2 0.1 µF
LSI 3 1/2-DIGIT A/D CONVERTER 14433 XU52
ANALOG FULL-SCALE REF
DISPLAY UPDATE
CLK I
CLK O
END OF CONVERSION
OVER RANGE
BCD DATA
DIGIT SELECT
RB 300 k
-5 V
LS109 U6
SPM 3 (T) ROOBC
LS05 U7
LS10 U24
SN3
IRQ (C) SPM 3.4
METER DISABLE
(DISABLED AS SHOWN IN OFF POSITION)
ADDRESS BUS
SPM 3 (S) METER SELECT
RAM LS670 U53
LS00 U8
LS00 U9
LS20 U11
LS04 U29
RN14 220
C3 1000 PF
C55 220 PF
(SN3 SHOWN IN OFF POSITION)
R/H FAULT (ON DISABLES)
TEMP FAULT (ON DISABLES)
DEW FAULT (ON DISABLES)
EXT ENVIR WARN (ON DISABLES)
EXT ENVIR FAULT (ON DISABLES)
SPM 3 (R) R00B0
LS244 U39
DATA BUS
SPM POWER CONTROL BOARD - A1
DEVELOPMENT DIVISION
60461620
D
SHEET SPM 1

J2
G4-N R39. 100k, 0.1%
G3-N R40. 100k, 0.1%
G2-N R41. 100k, 0.1%
G1-N R42. 100k, 0.1%
R55 20k 0.1% R56 20k 0.1% R57 20k 0.1% R58 20k 0.1%
G4-PH-1 R43. 100k, 0.1%
G3-PH-1 R44. 100k, 0.1%
G2-PH-1 R45. 100k, 0.1%
G1-PH-1 R46. 100k, 0.1%
R59 3.01k 0.1% R60 3.01k 0.1% R61 3.01k 0.1% R62 3.01k 0.1%
G4-PH-2 R47. 100k, 0.1%
G3-PH-2 R48. 100k, 0.1%
G2-PH-2 R49. 100k, 0.1%
G1-PH-2 R50. 100k, 0.1%
R63 3.01k 0.1% R64 3.01k 0.1% R65 3.01k 0.1% R66 3.01k 0.1%
KEY
REMØTE START (AT) 4
G4-PH-3 R51. 100k, 0.1%
G3-PH-3 R52. 100k, 0.1%
G2-PH-3 R53. 100k, 0.1%
G1-PH-3 R54. 100k, 0.1%
R67 3.01k 0.1% R68 3.01k 0.1% R69 3.01k 0.1% R70 3.01k 0.1%
MUX 4052 U48 0/1/2/3
MUX 4052 U49 0/1/2/3
MUX 4052 U50 0/1/2/3
MUX 4053 U51 1/2.3 X2 X1 EN3
RT8 10k 0.1%
R76, 121k 0.1%
R77 121k 0.1%
R81 21k 0.1%
R85 49.9k 0.1%
R79, 100k 0.1%
R83, 49.9k 0.1%
R84, 49.9k 0.1%
R80 100k
C24 0.1 µF
CR24
CR25
R89, 562 0.1%
R88, 1.0k 0.1%
AC AVE (E) SPM 1
R82, 21k 0.1%
CR28
CR27
CR26
R113 10
R114 510
Q21
C4 1 µF
R86, 140k 0.1%
R87, 100k 0.1%
AC PEAK (F) SPM 1
SPM 3 (W) W0091
RGTR LS373 XU54
RN6, 10k
RN7, 220
Q8 Q7 Q6 Q5 Q4 Q3 Q2 Q1
MG-1 RUN
MG-2 RUN
MG-3 RUN
MG-4 RUN
CHILLER RUN
PERIPHERAL
C00LING
REMØTE HØRN
SPM 3 (Y) W0090
RGTR LS373 U58
4049 U15
4011 U16
4011 U17
RN9, 10k
+5 V
DATA BUS
SPM 3 (Q) R0081
MG-4 STATUS
MG-3 STATUS
MG-2 STATUS
MG-1 STATUS
RN4 100k
R110 100k
RN3 1m C20 0.01 µF C21 0.01 µF C22 0.01 µF C23 0.01 µF
R119, 5.1k
R118, 1m
R117, 1m
R116, 1m
R115, 1m
Σ>0 339 U14
RN8, 10k
LS244 U40
METER ADD 0 (K) SPM 1
METER ADD 1 (J) SPM 1
METER ADD 2 (I) SPM 1
METER ADD 3 (H) SPM 1
METER ADD 4 (G) SPM 1

DEVELOPMENT DIVISION	SPM POWER CONTROL BOARD - A1	60461620	D
		SHEET SPM 2	PAGE

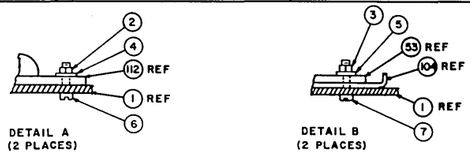

ADDRESS BUS
DATA BUS
RESET
SPM 4
+5 V
RN21
RT1
100
R123
21.5k
0.1%
2.5 V
REF
R122
24.9k
0.1%
R120
1k
R121
1m
CR31
CR32
C35
10 µF
K6 (RUN)
RN20
10k
RN21
10k
R124
10k
LSI
8-BIT MICROPROCESSOR
XUT4
MEM RDY
INTRPT REQ
NON-MASKABLE INTRPT
HALT
RESET
MEM ENBL
ENBL SYSTEM
ADRS BUS AVAIL
VALID MEM ADRS
READ/WRITE
DATA
ADRS
XCVR
LS245
U64
EPROM
2T32
XUT2
EPROM
2T32
XUT1
A4095
A0000
B047
A0000
RAM
6116
XUT0
LS244
U43
LS244
U44
LS04
U27
DIS CLOCK
SPM 4
R/W
SPM 3
PS SEL
SPM 5
INTER SEL
SPM 5
XTAL-1
4 MHz
R37
1k
R36
1k
C5
100 PF
CTR DIV 16
LS191
U36
CTR DIV 16
LS191
U37
LS86
U26
LS00
U23
LS04
U10
LS04
U20
LS00
U9
LS138
U65
LS138
U66
LS138
U67
LS138
U68
LS138
U69
LS04
U28
LS10
U24
LS20
U11
LS20
U25
LS04
U29
LS04
U10
R0086
R0085
R0083
R0082
R0081
R0080
R008C-008F
R008C
W0094
W0093
W0092
W0091
W0090
DIS SEL 2
DIS SEL 1
DOOR SEL
INTER SELECT
VMA
C36
C37
C38
C39
C40
C41
C42
C43
C44
C45
C46
C47
C48
C49
C50
C51
C52
C53
+12 V
-12 V
(RUN)
K6
7800
U34
+5 V
J1
CR20
CR8
CR21
CR9
CR22
CR10
CR23
CR11
+24 V
-24 V
RT2
1.50W
C12
4500 µF
C13
4500 µF
C11
330 µF
C7
2000 µF
C8
680 µF
C9
680 µF
C10
22 µF
T905.2
U33
-5.2 V
CR12
RT3
1.2k 2W
C14
390 µF
CR13
(RIDE THRU)
SPM POWER CONTROL BOARD - A1
60461620
D
DEVELOPMENT DIVISION
SPM 3


DATA BUS
ADDRESS BUS
J8
CEM START
CEM STØP
CEM S W
CEM L W
CEM ØN/ØFF
(RIDE THRU)
KEY
J9
S LØCAL
S REM 1
S REM 2
S REM 3
REMØTE 1 START
REMØTE 3 CEM START
REMØTE 2 START
REMØTE 2 SHØRT WARN
LØCAL START
RN5 100k
VC
4049 U30
4023 U31
CR29
R112 220
R107 10k
RN22 10k
C31 0.1 µF
C32 10 µF
R111 1k
Q19
CEM ØN
SPM 3 R0086
+5 V
RN21 10k
LS240 U62
EN2 EN1
D5 D4 D3 D2 D1 D0
SPM 3 AB
SPM 3 AD RESET
A2 A3 A1 A0
LSI PERIPHERAL INTERFACE ADAPTER 6821 U73
CHIP SEL
RØTR SEL
ENABLE
READ/WRITE
RESET
CØNT A INTERPT
CØNT B INTERPT
DATA
PØRT A
PØRT B
A INTRPT/CØNT
A INTRPT REG
B INTRPT REG
B INTRPT/CØNT
RN19 10k
RN20
RN18
PA7 PA6 PA5 PA4 PA3 PA2 PA1 PA0 CA1 CA2 CB2 PB7 PB6 PB5 PB4 PB3 PB2 PB1 PB0 CB1
J6
SPM 5 AK
SPM 5 AL
SPM 3 AJ
+24 V
K6 CLEAR
HØRN
STØP
IRQ SPM 3
J7
SPM 3 AN
LS240 U63
LS244 U45
DIS SEL 1
DIS SEL 2
SPM 3 AA
SPM 3 Z
A5 A4 A3 A2 A1 A0
R105 300 (PWR ØN)
R106 2.2k (PWR ADV)
+5 V
+24 V
J4
CR16
R108 10k
Q20
C34 10 µF
R101 2k
SW K1
(START)
TEST-2
TEST-1
SNG
CR30
CR17
CR18
CR19
R109 3k
R103 510
R97 90, 5W
(RUN)
LW K2
CR15
R58 90, 5W
(START)
K4
K5
K7
CR14
R74 10 2W
C6 4000 µF
7805 U32
C33 10 µF
VC +5 V
CONTROL DATA CORPORATION
DEVELOPMENT DIVISION
SPM PØWER CØNTRØL BØARD - A1
CODE IDENT
DWG NO
60461620
REV
D
SHEET
SPM 4
PAGE

SPM 3 W0092
DATA BUS
SPM 3 P0082
SW1
REMOTE WARNING
REMOTE OFF
WATER COOLING UNIT MARGINS
CHASSIS VOLTAGE MARGINS
RELATIVE HUMIDITY
DEW POINT MARGINS
ROOM TEMP MARGINS
MG MARGINS
SHOWN IN OFF POSITION ON ENABLES
10k
SPM 3 R0083
SW2
FAULT LATCH
SELECT CHILLER 3
SELECT CHILLER 2
SELECT CHILLER 1
SELECT MG 4
SELECT MG 3
SELECT MG 2
SELECT MG 1
SHOWN IN OFF POSITION ON ENABLES
10k
SPM 3 W0094
SPM 3 AC
J3
SHORT WARN
LONG WARN
CABINET ON
CABINET ON LINE
10k
SPM 3
SPM 1
+12 V
-12 V
+5 V
R128 10k 0.1%
R127 10k 0.1%
R125 5.1k
R126 5.1k
CR33
CR34
CR35
CR36
SPM 3 R0085
CHILLERS 3-ON
2-ON
1-ON
3-WARN
2-WARN
1-WARN
1k
10k
C25 0.1 µF
C26 0.1 µF
C27 0.1 µF
C28 0.1 µF
C29 0.1 µF
C30 0.1 µF
SPM 3 W0093
R35 1.0k 0.1%
R33 1.0k 0.1%
R34 1.0k 0.1%
C54 15 PF
-5.2 V
ADDRESS BUS
SPM 3 AH
SPM 1 AM
CAB ADD 4 A7
CAB ADD 3 A6
CAB ADD 2 A5
CAB ADD 1 A4
CAB ADD 0 A3
PS ADD 2 A2
PS ADD 1 A1
PS ADD 0 A0
RGTR LS373 U55
RGTR LS373 U56
RGTR F373 U57
LS240 U59
LS240 U60
LS244 U41
LS244 U42
LS240 U61
LS04 U22
LS04 U10
SN3 (PROG PWR OFF) SHOWN OFF
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
CR1 (REMOTE ON)
CR2 (CHILLER 2)
CR3 (CHILLER 1)
CR4 (SHORT WARN)
CR5 (LONG WARN)
CR6 (LATCH)
CR7 (RESET)
R94 430.2W
R95 430.2W
R99 150.2W
R100 200.2W
+24 V
+5 V
-5.2 V
TTL/ECL 10124 U19
R93 200
R91 200
R92 200
R90 200
HORN/LOCAL AL SPM 4
AK SPM 4
KEY
CHILLER-3 RUN
CHILLER-2 RUN
CHILLER-1 RUN
J3

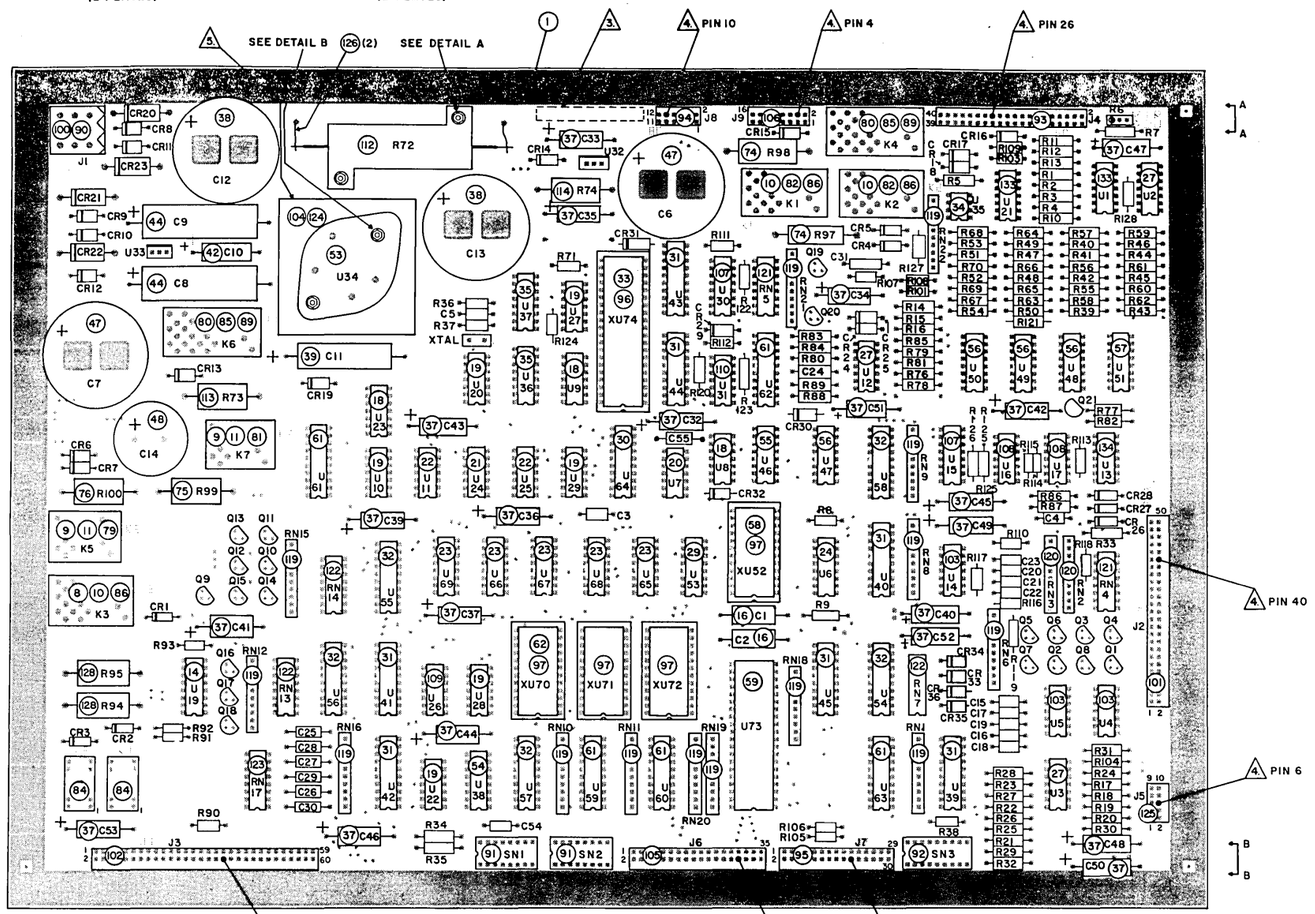
DEVELOPMENT DIVISION	SPM POWER CONTROL BOARD - A1	60461620	D
		SHEET SPM 5	

REVISION RECORD					
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
D	CA46758	CLASS A DRAWING	DLA	12 SEP	MS	MS
E	CA47715	SEE E.C.O.	CB	9 DEC		



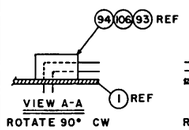
DETAIL A
(2 PLACES)

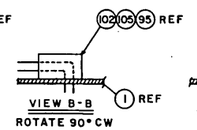
DETAIL B
(2 PLACES)

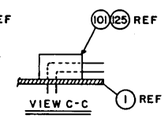


NOTES:
1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC. 53892600.
3. INK STAMP ASSEMBLY NO. AND REV ON NEAR SIDE PER SPEC. 10121502.
4. CLIP OFF PIN 40 OF J2, PIN 36 OF J3, PIN 26 OF J4, PIN 6 OF J5, PIN 30 OF J6, PIN 20 OF J7, PIN 10 OF J8, PIN 4 OF J9 FLUSH WITH CONNECTOR ON MATING SIDE ONLY PRIOR TO MOUNTING.
5. APPLY GREASE (24) BETWEEN HEAT SINK (104) AND BODY (53).
6. ESD PROCEDURES FOR HANDLING THIS ASSEMBLY SHALL BE FOLLOWED PER CDC SPEC 1.60.010.

FIND NO.	REF. DESIGNATION	FIND NO.	REF. DESIGNATION	FIND NO.	REF DESIGNATION	F/N	REF. DESIG.
12	CR20-CR23	51	R108, R124	87	C5	139	R123
15	CR24-CR36	64	R1, R4, R39-R54, R79, R80, R87	88	C15-C23, C54	140	R112
17	C3			111	R10, R71	141	R122
25	U33	65	R5	115	R105		
26	U32	66	R6	116	R106	135	R109
28	C24-C31	67	R9	117	R25	137	R119, R125, R126
36	R8	68	R11-R13, R24, R28, R104	118	R110	142	R83-R85
40	R14-R16, R30-R35, R88,	69	R38			143	R89
41	R2, R3, R17-R23, R78, R127, R128	70	R59-R70			145	R76, R77
		71	C55			146	R86
43	R7, R55-R58	73	R103, R114	132	R6	147	C4
45	R26, R27	77	XTAL			148	R90-R93
46	R29			136	R113	149	CR1-CR19
49	R36, R37, R111, R107, R120	83	Q1-Q20, Q21			144	R81-R82
50	R101			138	R115-R118, R121		







UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH
THIRD ANGLE PROJECTION

DWN	ANDERSON	11 SEP
CHKD		
ENGR		
MFG		
APVD		

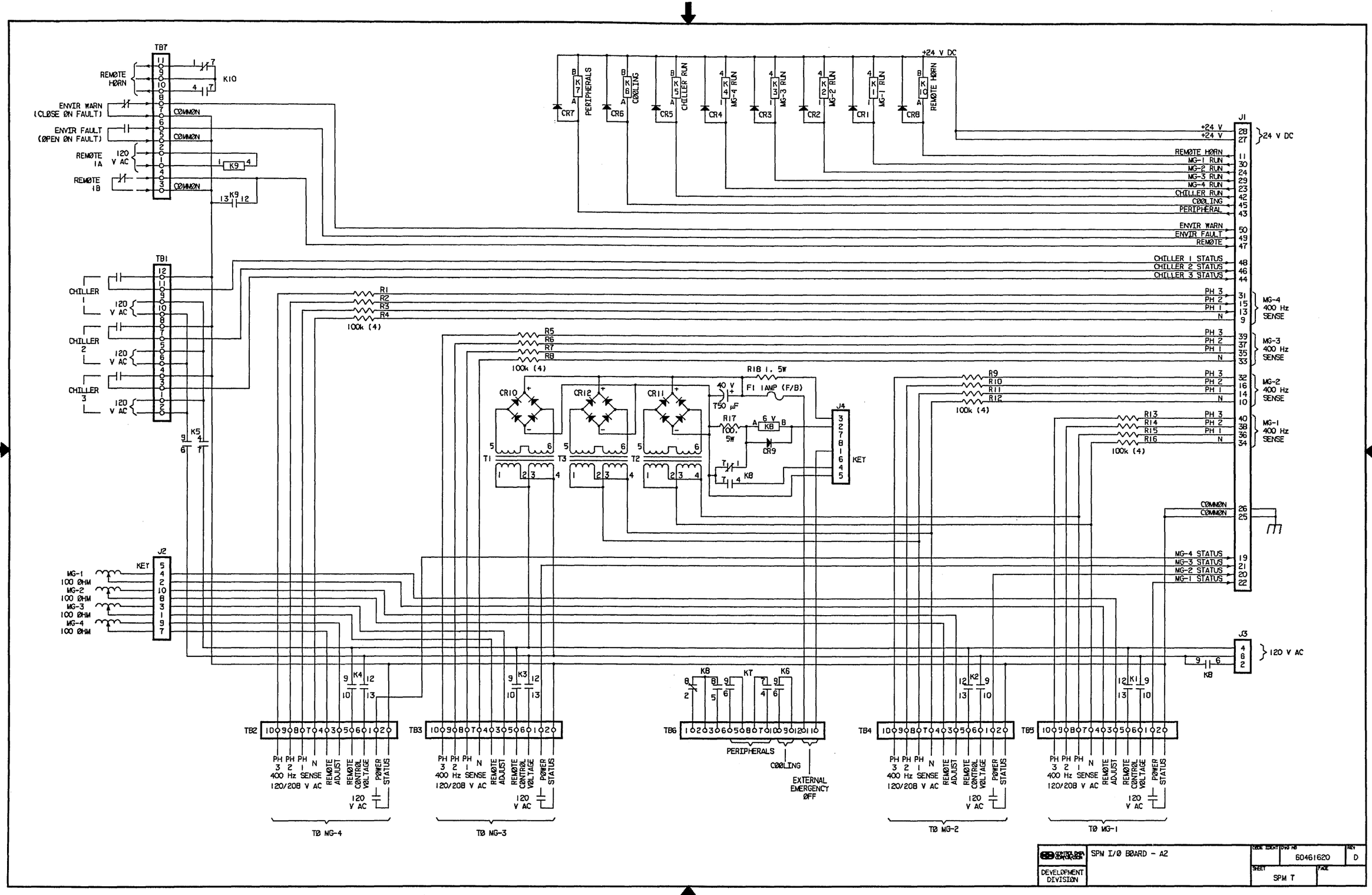
CONTROL DATA — ARDEN HILLS OPERATIONS ST. PAUL, MINN.

TITLE: SPM POWER CONTROL BOARD ASSY DWG (SPM-6)

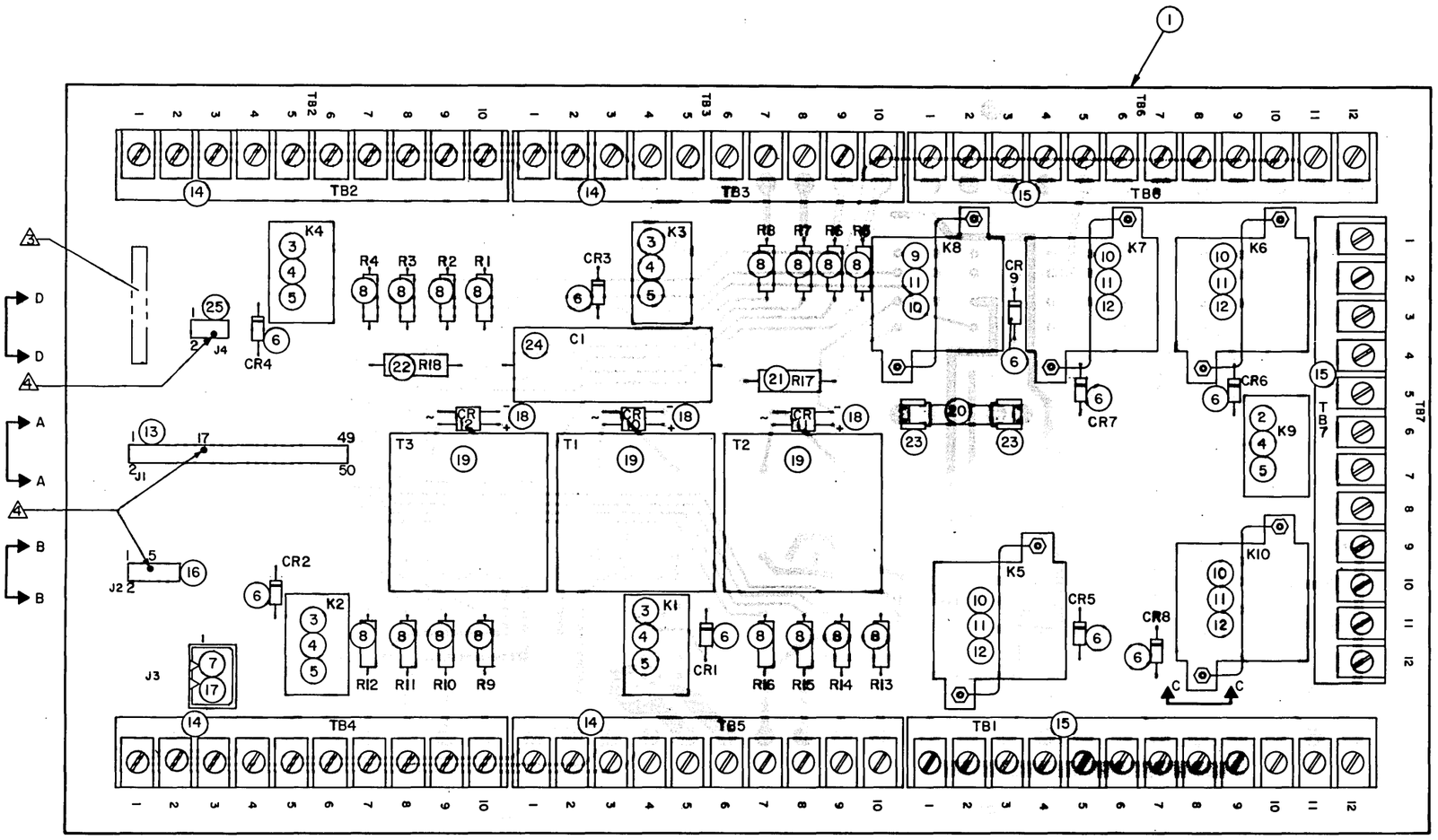
EQUIP NO. AD115-A

HM 67327675
PL 67327675
DETACHED LISTS

SIZE C | FSCM NO. 34010 | DWG NO. 67327675 | SCALE | SHEET OF

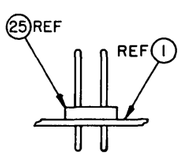

TB7
REMØTE HØRN
K10
ENVIR WARN (CLØSE ØN FAULT)
ENVIR FAULT (ØPEN ØN FAULT)
COMMØN
REMØTE 1A
REMØTE 1B
120 V AC
K9
TB1
CHILLER 1
CHILLER 2
CHILLER 3
K5
R1
R2
R3
R4
100k (4)
R5
R6
R7
R8
R18 1, 5W
CR10
CR12
CR11
40 V
F1 1AMP (F/B)
T50 µF
R17
5W
6 V
K8
CR9
T1
T3
T2
J4
KEY
+24 V DC
CR7
PERIPHERALS
CR6
CØØLING
CR5
CHILLER RUN
CR4
MG-4 RUN
CR3
MG-3 RUN
CR2
MG-2 RUN
CR1
MG-1 RUN
CR8
REMØTE HØRN
J1
+24 V
+24 V
24 V DC
REMØTE HØRN
MG-1 RUN
MG-2 RUN
MG-3 RUN
MG-4 RUN
CHILLER RUN
CØØLING
PERIPHERAL
ENVIR WARN
ENVIR FAULT
REMØTE
CHILLER 1 STATUS
CHILLER 2 STATUS
CHILLER 3 STATUS
PH 3
PH 2
PH 1
N
MG-4 400 Hz SENSE
MG-3 400 Hz SENSE
MG-2 400 Hz SENSE
MG-1 400 Hz SENSE
R9
R10
R11
R12
100k (4)
R13
R14
R15
R16
100k (4)
COMMØN
COMMØN
MG-4 STATUS
MG-3 STATUS
MG-2 STATUS
MG-1 STATUS
J2
KEY
MG-1 100 ØHM
MG-2 100 ØHM
MG-3 100 ØHM
MG-4 100 ØHM
J3
120 V AC
K8
K4
K3
K8
KT
K6
K2
K1
TB2
TB3
TB6
TB4
TB5
PH PH PH N
3 2 1
400 Hz SENSE
120/208 V AC
REMOTE ADJUST
REMOTE CONTROL VOLTAGE
PØWER STATUS
120 V AC
PERIPHERALS
CØØLING
EXTERNAL EMERGENCY ØFF
TØ MG-4
TØ MG-3
TØ MG-2
TØ MG-1
SPM I/Ø BØARD - A2
DEVELOPMENT DIVISION
60461620
D
SPM T

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
D	CA47048	SEE ECO	DLA	10-4-85		

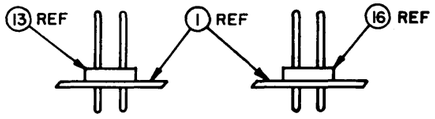


NOTES:

1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
3. INK STAMP ASSEMBLY NO. AND REV PER SPEC 10121502.
4. CLIP OFF PIN 17 OF J1 AND PIN 5 OF J2 PIN 6 OF J4 FLUSH WITH CONNECTOR, MATING SIDE ONLY.

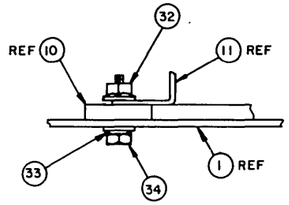


VIEW D-D
ROTATE 90° CCW



VIEW A-A
ROTATE 90° CCW

VIEW B-B
ROTATE 90° CCW



VIEW C-C
TYP (10) PLACES

HM 67327673
PL 67327673
DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH
THIRD ANGLE PROJECTION

DWN	L HILL	5-85
CHKD		
ENGR	M L Simons	
MFG		
APVD		

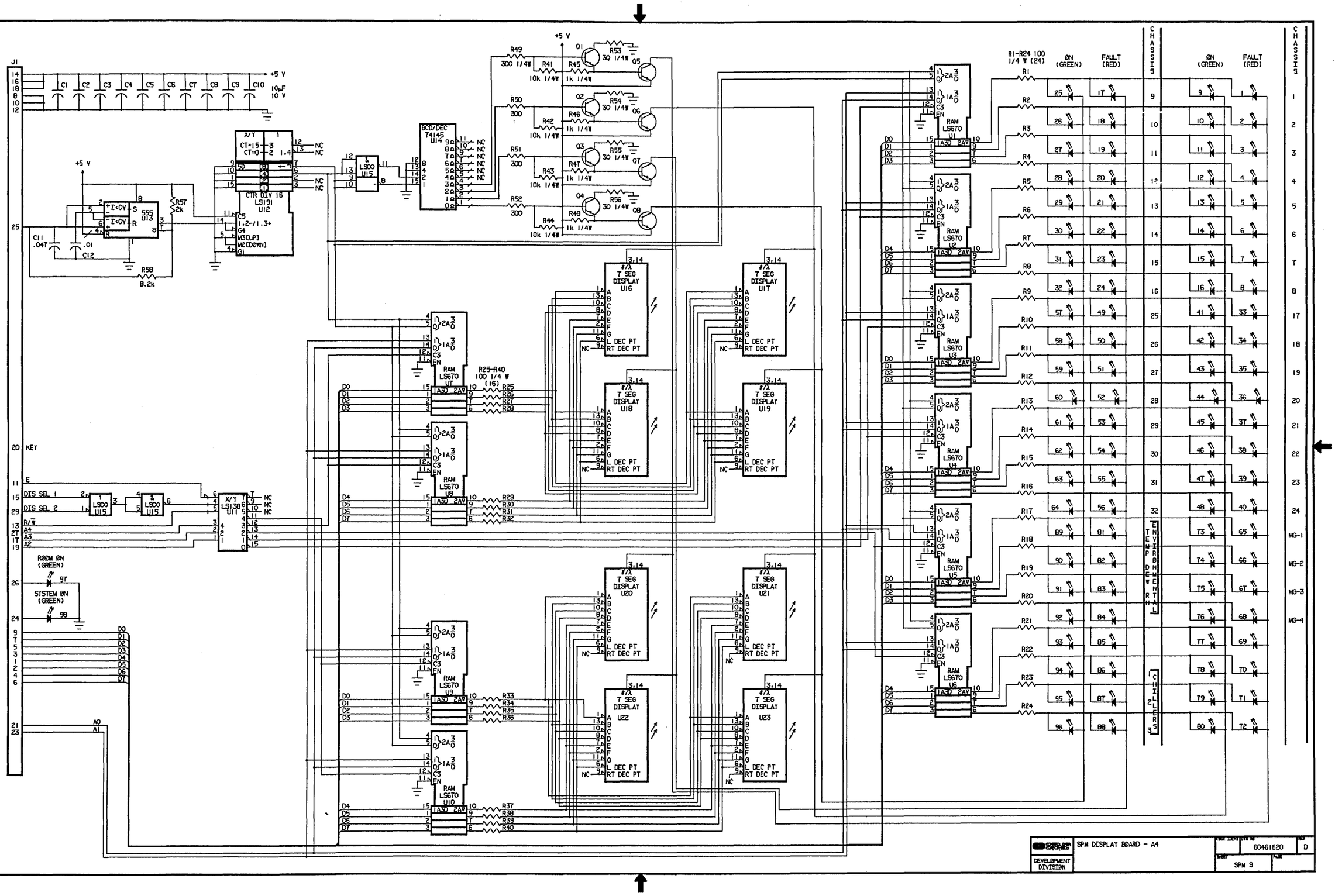
EQUIP. NO. AD115-A

CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

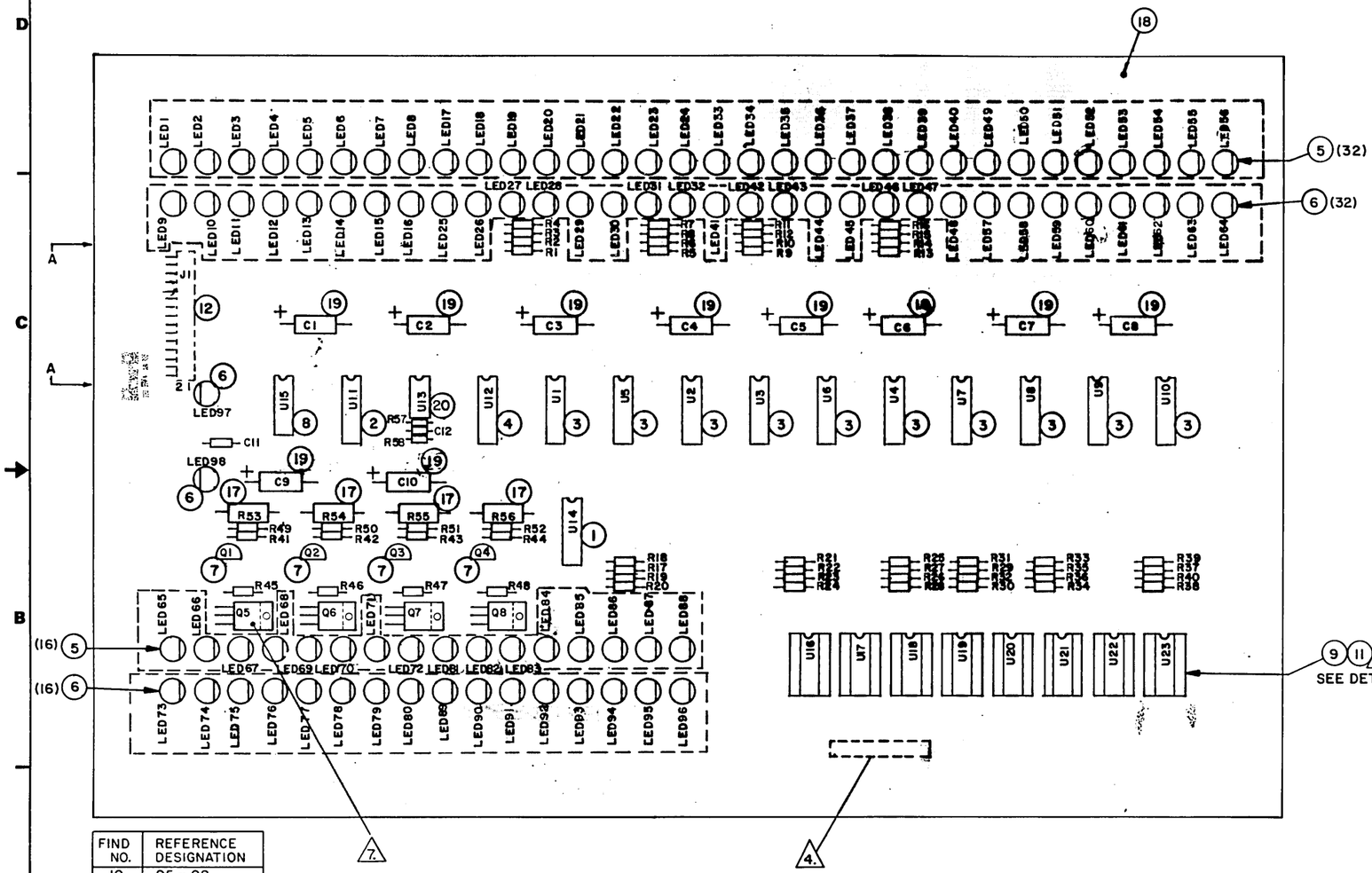
TITLE: SMP I/O BOARD A2
ASSY DWG (SPM-8)

SIZE D | FSCM NO. 34010 | DWG NO. 67327673

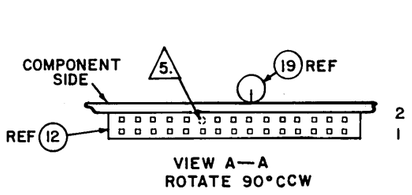
SCALE — SHEET — OF —

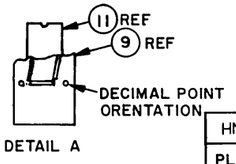

J1
+5 V
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10
10µF 10 V
X/Y CT=15 CT=0 CTR DIV 16 LS191 U12
555 TIMER U13
R57 2k
C11 .047
C12 .01
R58 8.2k
LS00 U15
BCD/DEC 74145 U14
R49 300 1/4W
R50 300
R51 300
R52 300
R41 10k 1/4W
R42 10k 1/4W
R43 10k 1/4W
R44 10k 1/4W
R45 1k 1/4W
R46 1k 1/4W
R47 1k 1/4W
R48 1k 1/4W
Q1 Q2 Q3 Q4
R53 30 1/4W
R54 30 1/4W
R55 30 1/4W
R56 30 1/4W
Q5 Q6 Q7 Q8
RAM LS670 U1 U2 U3 U4 U5 U6
R1-R24 100 1/4 W (24)
ON (GREEN)
FAULT (RED)
CHASSIS
R25-R40 100 1/4 W (16)
7 SEG DISPLAY U16 U17 U18 U19 U20 U21 U22 U23
DEC PT RT DEC PT
KEY
DIS SEL 1
DIS SEL 2
R/W
A4 A3 A2
R00M ON (GREEN)
SYSTEM ON (GREEN)
D0 D1 D2 D3 D4 D5 D6 D7
A0 A1
MEMORY CHASSIS
MG-1 MG-2 MG-3 MG-4
SPM DISPLAY BOARD - A4
60461620
D
SPM 9

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
C	CA47048	CLASS A DRAWING	D.A.	10-11-85		



FIND NO.	REFERENCE DESIGNATION
10	Q5 - Q8
13	R1 - R40
14	R41 - R44
15	R45 - R48
16	R49 R52
21	R57
22	R58
23	C12
24	C11





NOTES:

1. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
3. MOUNT SOCKETS (11) IN LOCATION U16—U23 BEFORE IC DISPLAYS (9)
4. MARK ASSEMBLY NO AND REV PER SPEC. 10121502.
5. CLIP PIN 20 OF J1 FLUSH WITH CONNECTOR ON MATING SIDE ONLY PRIOR TO MOUNTING.
6. COMPONENTS COMMON WITHIN DOTTED LINE.
7. Q5—Q8 TO BE INSTALLED WITH METAL PLATE UP.

HM 67327671
PL 67327671
DETACHED LISTS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES
PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	A. POWERS	10-20
CHKD		10-23
ENGR		6-19-87
MFG		4-24-87
APVD		
EQUIP. NO	AD115-A	
THIRD ANGLE PROJECTION		

CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
SPM DISPLAY BOARD A4
ASSEMBLY DRAWING (SPM-10)

SIZE D | FSCM NO. 34010 | DWG NO. 67327671
SCALE | SHEET OF

69

INTERBAY MONITOR

The Interbay Monitor Board diagrams (INB MON-1 through INB MON-4) show the interbay monitor board, used on the CYBER 180 Model 990 and CYBER 990E and 995E computer systems, and its input and output signals. The interbay monitor performs continuous polling of column fault and power supply conditions† after application of system power. Addresses from the SPM drive the interbay monitor. The circuit consists of an array of analog multiplexers, an address decoder, and two regulators which supply ± 8 volts.

The analog multiplexers reside in locations U1 through U32. Multiplexers in locations U1 through U16 poll faults, and multiplexers in locations U17 through U32 poll power supply voltages. Address decoding is performed by:

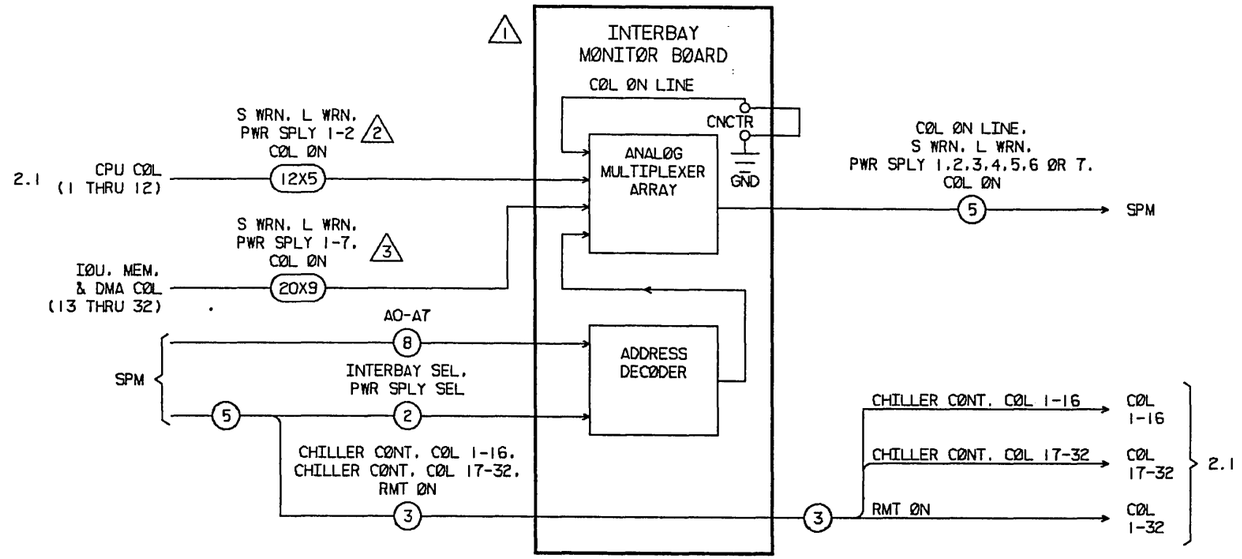
Four decoders at locations U41 through U44.
Two AND gates at location U39.
Two latches at locations U45 and U46.

Polling intervals are different for faults and power supply voltages. Fault intervals monitor each cabinet for approximately two microseconds. Information contained in address bits A0 through A7 from the SPM drives the address decoder, and changes at intervals of approximately two microseconds. Address decoder output enables four analog multiplexers (one row) simultaneously within locations U1 through U16 and selects one input on each multiplexer. The selected input on each of the four enabled multiplexers is gated through to the output (pin 3). Thus, the SW, LW, On, and plugged fault conditions for a given column at a given interval appear on J33-6/15/23/26. Every 250 to 350 ms an interval of approximately 20 ms occurs which allows the meter in the SPM to make a power supply measurement. During power supply intervals, the address decoder enables the proper analog multiplexers so that Meter Power Supply and Meter Common appear at J33-13/25 at a given time. A0 through A2 are power supply address bits and A3 through A7 are column address bits.

The SW, LW, On, and Plugged outputs on J33 go to the SPM where they enable fault circuits when applicable. Meter Power Supply and Meter Common also go to the SPM for measurement and fault enabling when required. Firmware in the SPM controls A0 through A7. A0 through A7 are valid when Interbay Select from the SPM is active. Power Supply Select latches the power supply selection address bits at locations U45 and U46. Power Supply Select is active for about 250 nsec and falls in the center of the 2 nsec Interbay Select signal. Chiller Cont Col 1-16 from the SPM is associated with columns 1 through 16. It activates LW upon fault detection and removes column power if the fault persists. Chiller Cont Col 17-32 relates to columns 17 through 32 and functions the same as Chiller 1. RMT On turns column power off and on.

The Column On Line signal indicates whether or not a column is on and set to remote. If the cable to the interbay monitor board (J1 - J32) is plugged in and the column is set to remote, the Column On Line signal is at ground and the SPM monitors the column. If the cable to the interbay monitor board is not plugged in, or the column is set to local, the Column On Line signal floats and the SPM does not monitor the column.

†The interbay monitor does not poll AB115-A IOU.



NØTES:

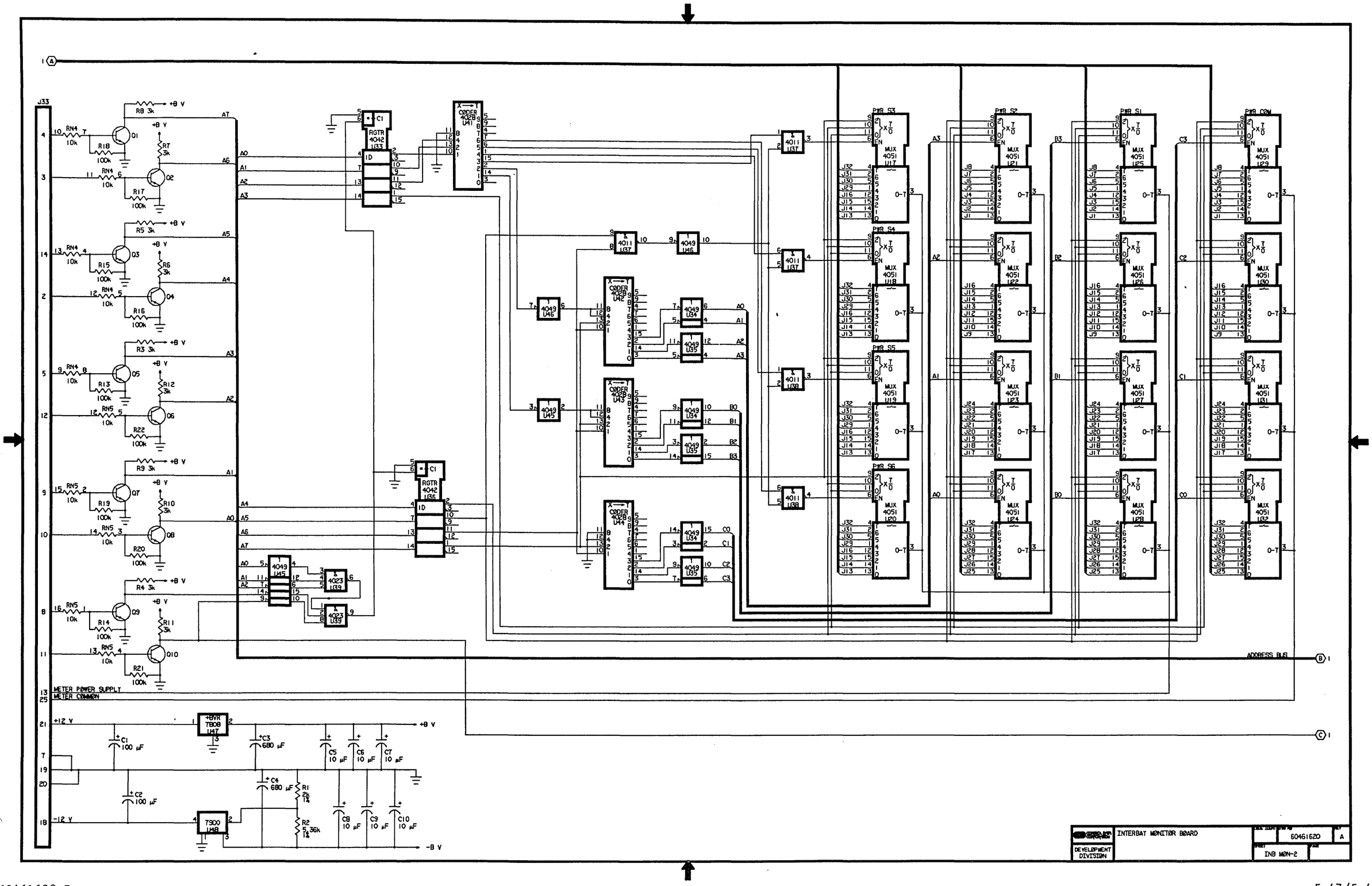
1. THE INTERBAY MØNITØR MØUNTS IN THE INTERBAY SECTIØN ØF THE CABINET.

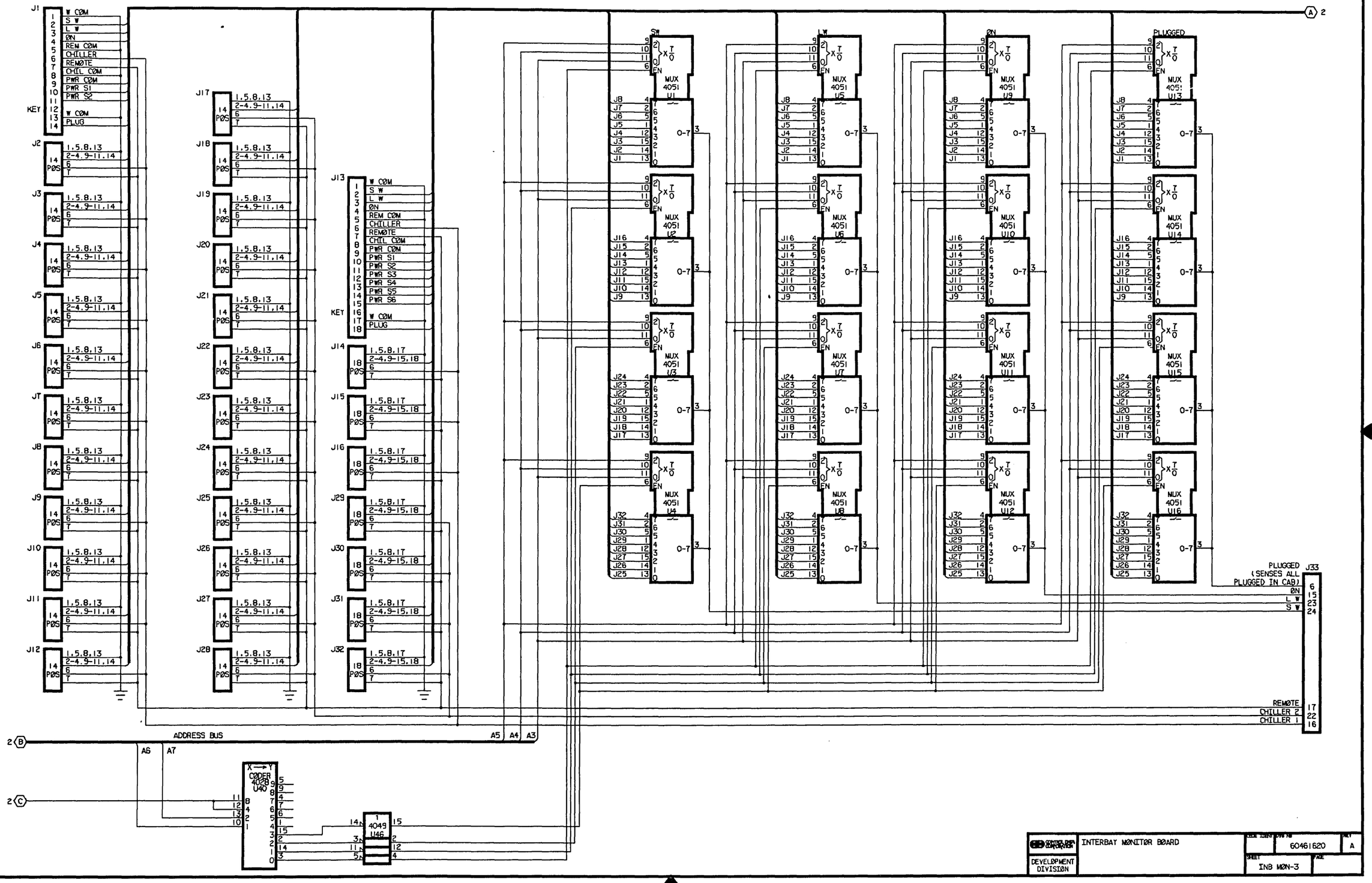
2. CPU PØWER SUPPLIES:
   PWR SPLY 1 = -2.7V
   PWR SPLY 2 = -4.7V

3. IØU, MEM. AND DMA PØWER SUPPLIES:

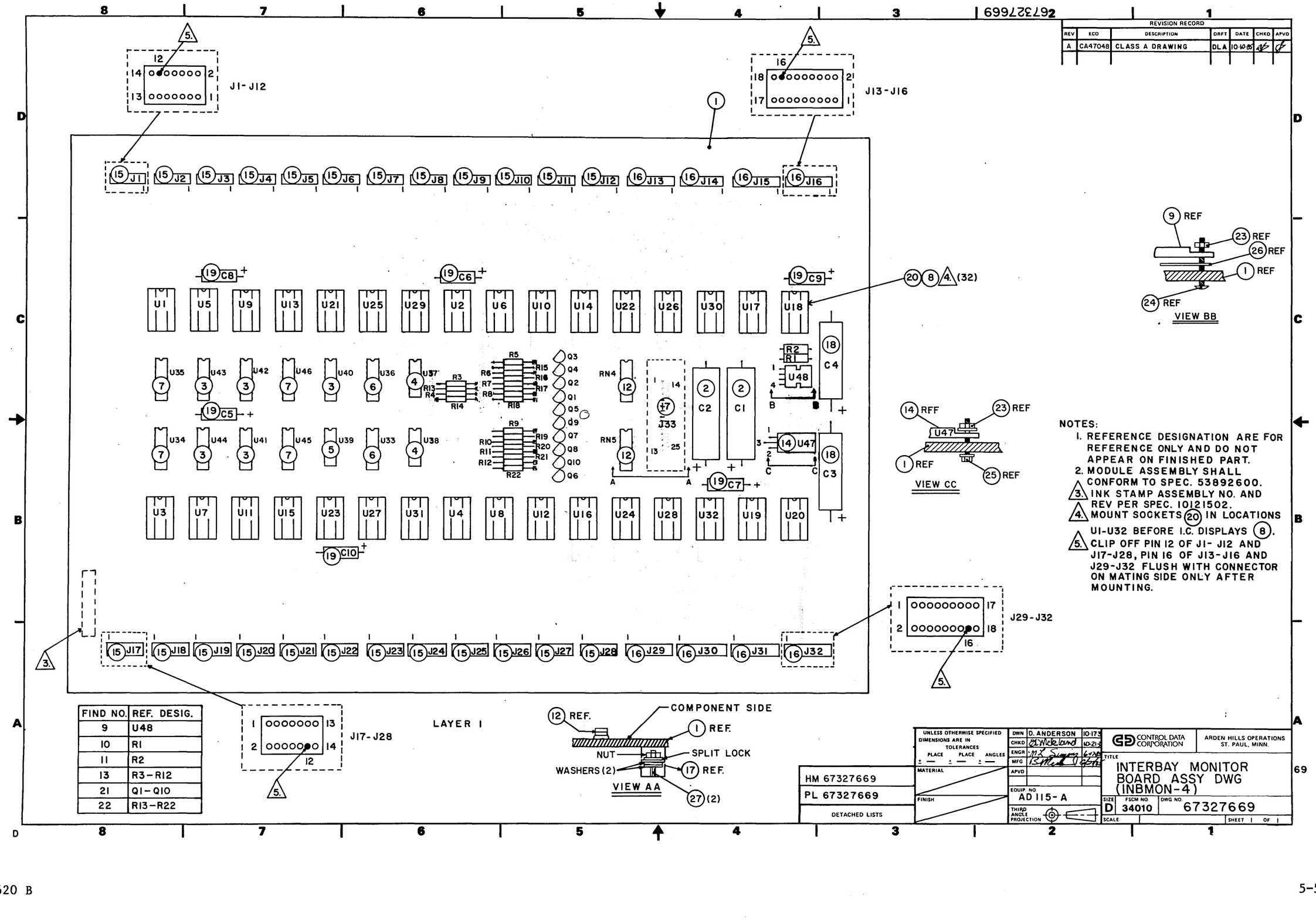
	IØU		MEM			DMA
PWR SPLY	AB115	AT478	BS175/6 (EARLY)	BS175/6 (LATER)	BS218	AT481
1	-2.2V	-2.2V	-2.2V	-2.2V	-2.2V	-2.2V
2	-5.2	-5.2	-5.2	-4.7	-5.2	-5.2
3	+5.0	+5.0	-5.2	-4.7	+5.5	+5.0
4	NU	-12.0	-5.2	-4.7	NU	NU
5	NU	+12.0	-5.2	-4.7	NU	NU
6	NU	NU	NU	NU	NU	NU

CONTROL DATA CORPORATION	INTERBAY MØNITØR BØARD (USED WITH AD115/6-A AND AD115/6-B)	CØDE IDENT	DWG NØ 60461620 REV D
DEVELØPMENT DIVISIØN		C	SHEET INB MØN-1 PAGE


J33
+8 V
R8 3k
Q1
R18 100k
RT 3k
Q2
R17 100k
R5 3k
Q3
R15 100k
R6 3k
Q4
R16 100k
R3 3k
Q5
R13 100k
R12 3k
Q6
R22 100k
R9 3k
Q7
R19 100k
R10 3k
Q8
R20 100k
R4 3k
Q9
R14 100k
R11 3k
Q10
R21 100k
RN4 10k
RN5 10k
A0
A1
A2
A3
A4
A5
A6
A7
C1
RGTR 4042 U33
RGTR 4042 U36
CODER 4028 U41
CODER 4028 U42
CODER 4028 U43
CODER 4028 U44
4011 U37
4049 U46
4049 U45
4049 U34
4049 U35
4023 U39
PWR S3
PWR S4
PWR S5
PWR S6
PWR S2
PWR S1
PWR COM
MUX 4051 U17
MUX 4051 U18
MUX 4051 U19
MUX 4051 U20
MUX 4051 U21
MUX 4051 U22
MUX 4051 U23
MUX 4051 U24
MUX 4051 U25
MUX 4051 U26
MUX 4051 U27
MUX 4051 U28
MUX 4051 U29
MUX 4051 U30
MUX 4051 U31
MUX 4051 U32
A3
A2
A1
A0
B3
B2
B1
B0
C3
C2
C1
C0
ADDRESS BUS
METER POWER SUPPLY
METER COMMON
+12 V
-12 V
+8VR 7808 U47
7900 U48
C1 100 µF
C2 100 µF
C3 680 µF
C4 680 µF
C5 10 µF
C6 10 µF
C7 10 µF
C8 10 µF
C9 10 µF
C10 10 µF
R1 2k 1%
R2 5.36k 1%
+8 V
-8 V
INTERBAY MONITOR BOARD
DEVELOPMENT DIVISION
60461620
A
INB MON-2


J1
W COM
S W
L W
ØN
REM COM
CHILLER
REMØTE
CHIL COM
PWR COM
PWR S1
PWR S2
KEY
W COM
PLUG
J2
J3
J4
J5
J6
JT
J8
J9
J10
J11
J12
1.5.8.13
2-4.9-11.14
14 PØS
J13
W COM
S W
L W
ØN
REM COM
CHILLER
REMØTE
CHIL COM
PWR COM
PWR S1
PWR S2
PWR S3
PWR S4
PWR S5
PWR S6
KEY
W COM
PLUG
J14
J15
J16
1.5.8.17
2-4.9-15.18
18 PØS
J17
J18
J19
J20
J21
J22
J23
J24
J25
J26
J27
J28
J29
J30
J31
J32
SW
LW
ØN
PLUGGED
MUX 4051
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
0-7
EN
PLUGGED (SENSES ALL PLUGGED IN CAB)
J33
ØN
L W
S W
REMØTE
CHILLER 2
CHILLER 1
ADDRESS BUS
A5
A4
A3
A6
A7
2B
2C
CODER 4028
U40
4049
U46
A 2
INTERBAY MØNITØR BØARD
DEVELØPMENT DIVISIØN
60461620
A
INB MØN-3

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
A	CA47048	CLASS A DRAWING	DLA	10-10-85		



FIND NO.	REF. DESIG.
9	U48
10	R1
11	R2
13	R3-R12
21	Q1-Q10
22	R13-R22

NOTES:
1. REFERENCE DESIGNATION ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC. 53892600.
3. INK STAMP ASSEMBLY NO. AND REV PER SPEC. 10121502.
4. MOUNT SOCKETS (20) IN LOCATIONS U1-U32 BEFORE I.C. DISPLAYS (8).
5. CLIP OFF PIN 12 OF J1- J12 AND J17-J28, PIN 16 OF J13-J16 AND J29-J32 FLUSH WITH CONNECTOR ON MATING SIDE ONLY AFTER MOUNTING.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES PLACE ± PLACE ± ANGLES ±

MATERIAL

FINISH

THIRD ANGLE PROJECTION

DWN	D. ANDERSON	10-17-85
CHKD	[illegible]	10-21-85
ENGR	[illegible]	
MFG	[illegible]	
APVD		

EQUIP. NO AD 115-A

HM 67327669
PL 67327669
DETACHED LISTS

CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
ST. PAUL, MINN.

TITLE
INTERBAY MONITOR BOARD ASSY DWG (INBMON-4)

SIZE	FSCM NO.	DWG NO.
D	34010	67327669

SCALE

SHEET 1 OF 1

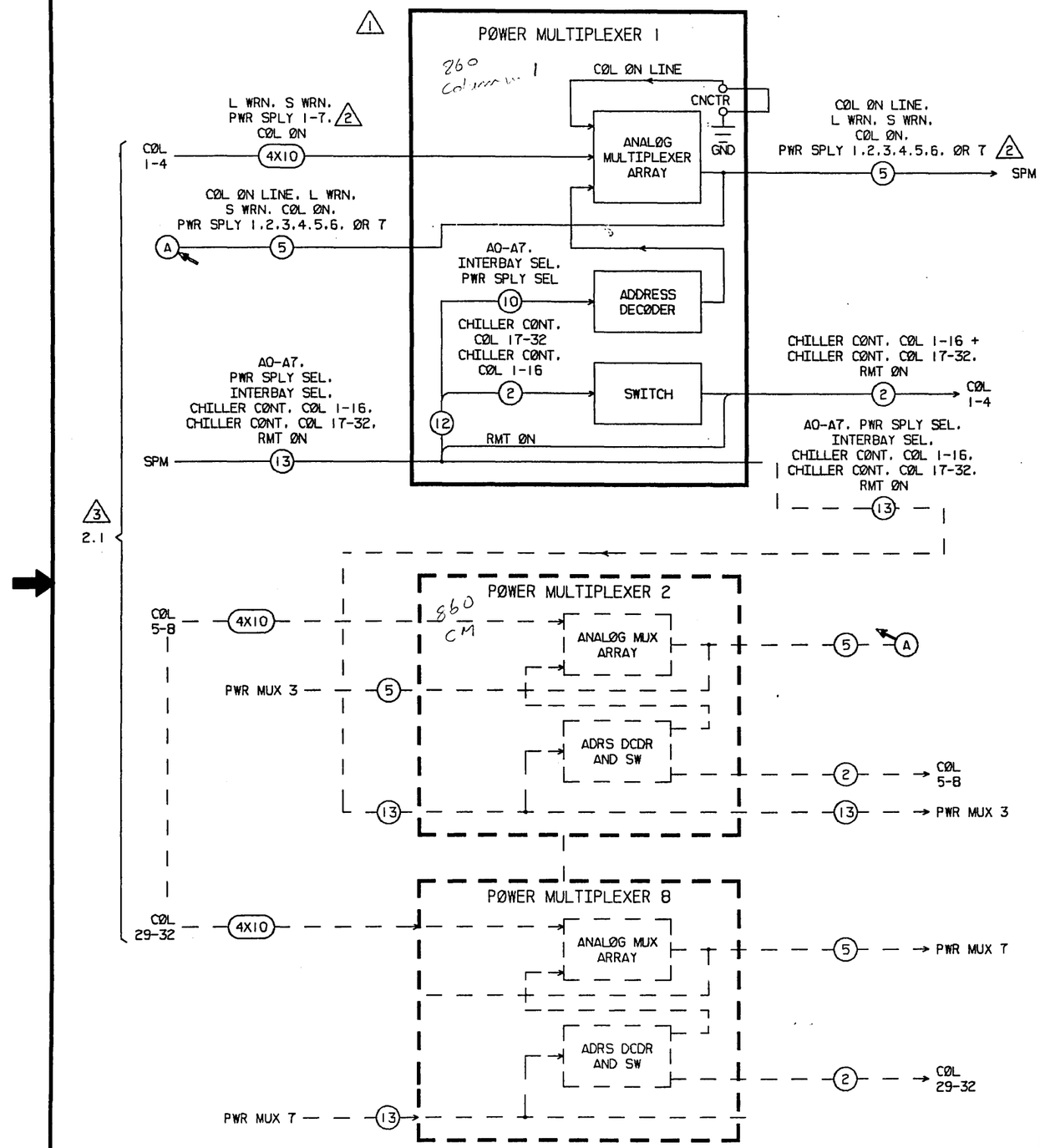
POWER MULTIPLEXER

The Power Multiplexer diagrams (PWR MUX-1 and PWR MUX-2) show the power multiplexer board used on the CYBER 180 Models 840, 850, and 860; the CYBER 845S, 855S, 840A, 850A, and 860A; and the CYBERPLUS computer systems, with input and output signals. The power multiplexer continuously polls fault and power supply information from the columns which comprise the CP, IOU,† and memory columns of a system. Up to four columns can connect to a power multiplexer board. Up to eight power multiplexers can connect in parallel to allow monitoring of up to 32 columns. Addresses from the SPM drive the address decoder which enables the Short Warning, Long Warning, Col On Line, and Col On signals from a specified column to pass through the analog multiplexer array to the SPM. At periodic intervals, an interrupt occurs during which one of the power supply signals for a specified column is gated through the analog multiplexers to the SPM. Short Warning, Long Warning, Col On Line, and Col On connect to fault circuitry in the SPM. The selected power supply signal connects to a meter and fault circuitry in the SPM.

Interbay Sel enables the address decoder, and PWR SPLY Sel latches the power supply address bits into the decoder. Power supply address bits are latched because the meter in the SPM requires a relatively long time for measurement. The chiller switches in positions, 0 and 1 on each power multiplexer board, enable the removal of power from the related columns when a water cooling unit fault persists after the Long Warning and Short Warning in the SPM expire. Switch S1, on the power multiplexer board, selects chiller 1 (switch position 0) or chiller 2 (switch position 1), depending on which water cooling units are connected to the multiplexer board. RMT ON controls power-off/on for the columns that are connected to the multiplexer board.

The Column On Line signal indicates whether or not a column is on and set to remote. If the cable to the power multiplexer board is plugged in and the column is set to remote, the Column On Line signal is at ground and the SPM monitors the column. If the cable to the multiplexer board is not plugged in, or the column is set to local, the Column On Line signal floats and the SPM does not monitor the column.

†The power multiplexer does not poll AB115-A IOU.



NØTES:

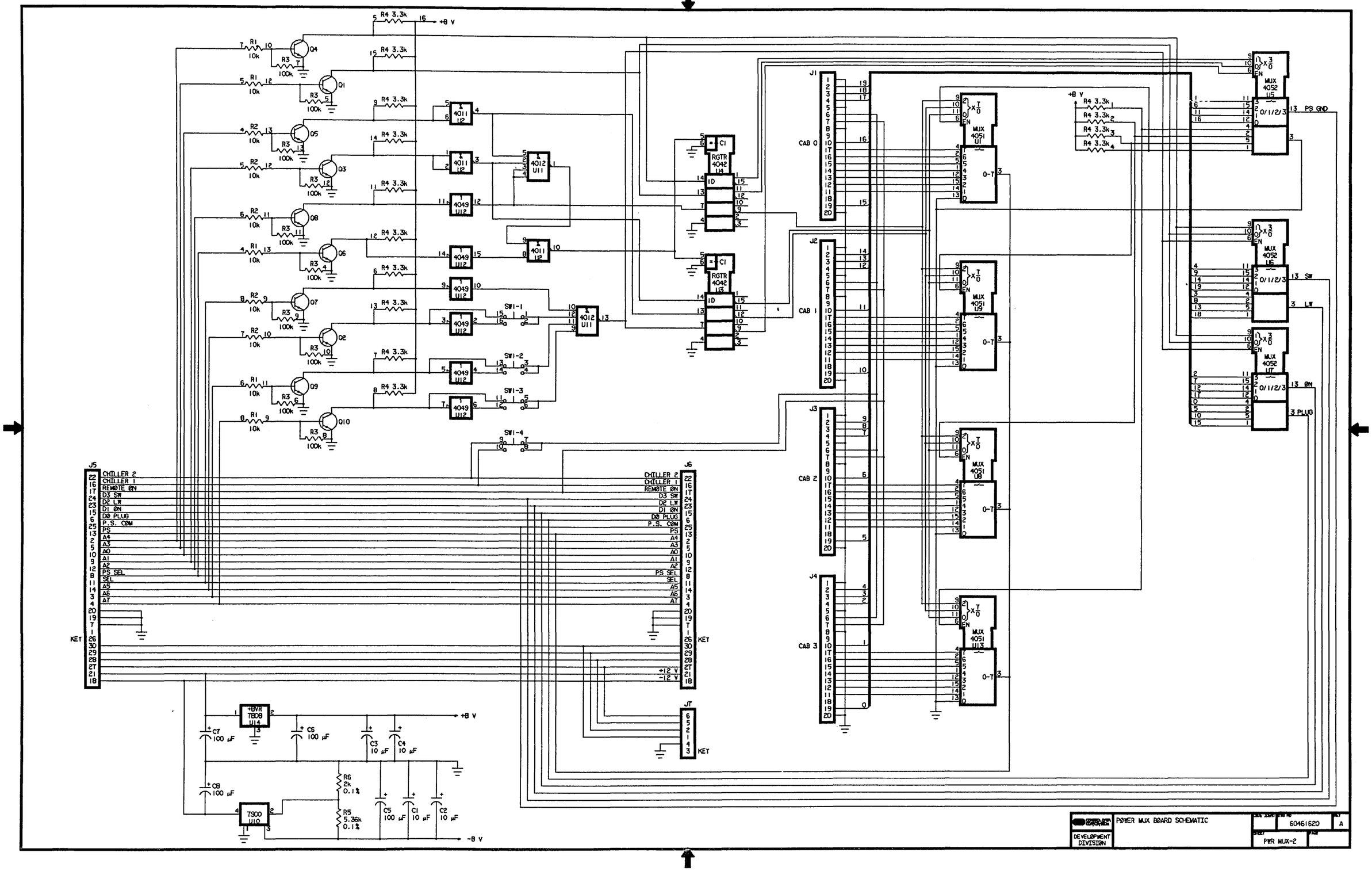
1. THE PØWER MULTIPLEXER BØARDS MØUNT IN THE INTERBAY SECTIØN ØF THE CABINET IN AD112/3 MACHINES. IN AD118 MACHINES, THEY MØUNT IN THE CABLE ENTRY SECTIØN.

2. IØU. MEM. DMA. AND CPU PØWER SUPPLIES:

PWR SPLY	IØU		MEM	DMA	CPU
	AB115	AT478	BS213	AT481	
1	-2.2V	-2.2V	-2.2V	-2.2V	-2.2V
2	-5.2	-5.2	-5.2	-5.2	-4.7
3	+5.0	+5.0	+5.0	+5.0	NU
4	NU	-12.0	-2.2	NU	NU
5	NU	+12.0	-5.2	NU	NU
6	NU	NU	NU	NU	NU
7	NU	NU	NU	NU	NU

3. THE CØLUMNS CAN BE IØU. MEM. DMA. ØR CPU CØLUMNS. ØNLY CPU AND IØU (AT478) CØLUMNS ARE REPRESENTED ØN 2.1.

CONTROL DATA CORPORATION	PØWER MULTIPLEXER BØARD (USED WITH AD112/3 AND AD118)	CØDE IDENT	DWG NØ 60461620	REV A
DEVELØPMENT DIVISIØN		C	SHEET PWR MUX-1	PAGE



DEVELOPMENT DIVISION

POWER MUX BOARD SCHEMATIC

60461620

A

PWR MUX-2

LSI/ZIF COLUMN POWER DISTRIBUTION

Each LSI or ZIF column has a power distribution system. The LSI/ZIF column power distribution diagram (COL PWR-1) shows:

- The circuitry which controls power application/removal and amplitude.
- The circuitry which converts 400-Hz three-phase ac into -4.7 V dc, -2.7 V dc, and -2.2 V dc logic power.
- Overvoltage, overcurrent, and temperature-detect circuits.
- Signals from the control/protect circuits which control power application/removal and power removal during fault conditions.

NOTE

ZIF columns are wired slightly different than LSI columns. Also, CYBERPLUS ZIF columns have different circuit breakers. Refer to ZIF Power Distribution Box (PD Box-2).

The following information assumes that the equipment has power applied and is operating properly.

LSI/ZIF Column Circuit Description

400-Hz three-phase ac from the MG feeds through CB1, K1 and K2, and appears at transformer T2 and CB3. Through CB4, T2 supplys 400-Hz power to the ac to dc converter which generates -4.7 V dc. T2 provides 0 to 120% adjustment of the -4.7 V dc output. From CB3, 400-Hz power goes to T1 which supplies the ac to dc converter which, in turn, generates -2.7 V dc. T1 provides 0 to 140% adjustment of the -2.7 V dc output. The -2.7 V dc drives regulators (when present) which generate -2.2 V dc. ZIF columns do not have -2.2 V regulators. Instead, T1 is adjusted so that the ac to dc converter provides -2.2 V directly.

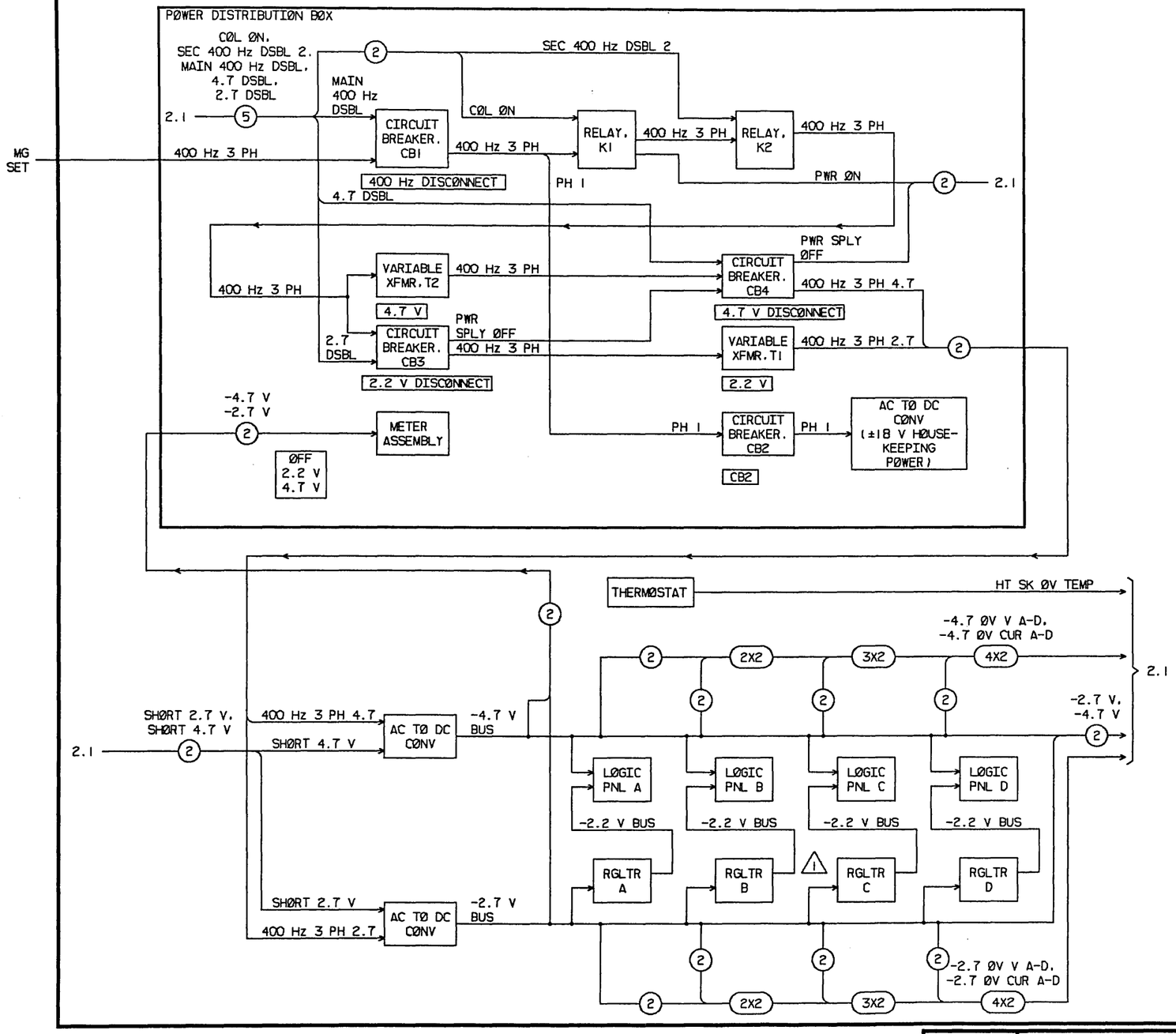
One phase of the 400-Hz input goes from CB1 through CB2 to a supply which generates housekeeping power. The ac to dc converters have a common heat sink. A thermostat activates if the heat sink reaches 65 °C (150 °F). Taps on the -4.7 V and -2.7 V buses provide fault detect signals during overvoltage and overcurrent conditions. Overtemperature, overvoltage, and overcurrent faults result in the equipment being powered-down if the faults persist longer than a predefined time.

LSI/ZIF Column Signal Description

Refer to LSI/ZIF Column Control and Protection in the following text for more detail on the signals.

- Col On - Controls relay K1 to apply/remove 400-Hz power during power-up/down functions or remove 400-Hz power during fault conditions.
- Main 400-Hz DSBL (Disable) - Controls CB1 to remove 400-Hz during certain fault conditions.
- Sec 400-Hz DSBL 2 - Controls relay K2 to remove 400-Hz power during certain fault conditions.
- 2.7 DSBL - Controls CB3 to remove 400-Hz during certain fault conditions.
- 4.7 DSBL - Controls CB4 to remove 400-Hz during certain fault conditions.
- Short 2.7-V - Causes the 2.7-V ac to dc converter output to short to ground during transient conditions.
- Short 4.7-V - Causes the 4.7-V ac to dc converter output to short to ground during transient conditions.
- HT SK OV Temp (heat sink overvoltage temperature) - Activates a fault circuit when the ac to dc converter heat sink reaches 65 ^{o}C (150 ^{o}F).
- 4.7 OV (overvoltage) A-D - Sense overvoltage on the 4.7-V buses supplying logic panels A through D.
- 2.7 OV A-D - Sense overvoltage on the 2.7-V buses supplying logic panels A through D.
- 4.7 OV C (overcurrent) A-D - Sense overcurrent on the 4.7-V buses supplying logic panels A through D.
- 2.7 OV C A-D - Sense overcurrent on the 2.7-V buses supplying logic panels A through D.

CØLUMN (1-32) ⚠2



NØTES:

⚠1 ZIF CØLUMNS (WHEN PRESENT) DØ NØT HAVE -2.2 V REGULATØRS. REFER TØ TEXT.

⚠2 THIS DIAGRAM REPRESENTS ØNE CØLUMN. A SYSTEM CAN HAVE UP TØ 32 CØLUMNS.

CONTROL DATA CORPORATION	LSI/ZIF CØLUMN PØWER DISTRIBUTIØN	CODE IDENT	DWG NØ 60461620	REV A
DEVELØPMENT DIVISIØN		C	SHEET CØLPWR-1	PAGE

LSI/ZIF COLUMN CONTROL AND PROTECTION

The LSI/ZIF Column Control and Protection diagram (COL PWR-2) shows the circuit boards, sensors, and signals which perform the control and protection functions within an LSI or ZIF column.

LSI/ZIF Column Control

The control circuitry provides the capability to power-up and reset the system.

LSI/ZIF Column Power Application

The power application function can occur at the column (local) or via the SPM (remote). The LOCAL/REMOTE switch (S4) determines power application mode. S4 set to LOCAL enables relay K4 to activate through contacts S4A if no faults exist and the circuit breakers are on (refer to Power Distribution in the preceding pages). In local mode, the Col On signal to the interbay monitor is inhibited by contacts S4C. The SPM display then indicates that the column is off. When S4 is set to REMOTE, the Remote On or Start/Stop signals control K4. The Start/Stop signals are not used in this application.

Energizing K4 causes:

- Contacts K4A to connect one side of the K6 short warning relay coil to ground.
- Contacts K4C to put the Col On signal online to the interbay monitor.
- Contacts K4D to apply the Col On signal to the -2.2 V regulators via the temperature-protect boards. This clears the regulator fault circuit.
- Contacts K4F to cause power application to water cooling units (if system has GH251-A or GH251-C).
- Contacts K4E to apply the Col On signal to the coil of relay K1 in the power distribution circuitry.

When K1 energizes, 400-Hz power appears at the ac to dc converters and logic power is available. Contacts K4B and K6B are not used in this application.

LSI/ZIF Column Reset

Reset occurs upon power application and upon manual actuation of the RESET switch (S3) in the power distribution box. Power application and manual reset perform common functions and discrete functions. Both power application and manual reset:

- Disable the K3 fault relay set input momentarily. This prevents noise from setting K3 during the reset function.
- Clear the latch (not shown in diagram) in the power control board for the PRI HIGH TEMP LED in the transient-protect board via the temperature fault latch signal.
- Clear the latch (not shown in diagram) for the PRI HIGH TEMP LEDs in the temperature-protect board via the temperature fault latch signal.
- Clear the fault latch (not shown in diagram) in the power control board. This clears the CHILLER FAULT, PRI HIGH TEMP, POWER SUPPLY OFF, and CABLE FAULT LEDs in the transient-protect board.

Discrete manual reset functions are:

- Clearing the K3 fault latching relay (if there are no fault conditions). Refer to Fault Relay in this section for further information on the K3 fault relay.
- Clearing the latch (not shown in diagram) for the BACK UP HIGH TEMP, BACK UP LOW TEMP, 4.7-V FAULT, and 2.2-V FAULT LEDs in the transient-protect board via the PS + BU Fault + Reset signal.
- Clearing the latch (not shown in diagram) for the BACK UP HIGH TEMP LED in the temperature-protect board via the fault latch signal. BU Fault LCH derives from PS + BU Temp Fault + Reset.

Power-on reset clears the Start/Stop latch circuit and is ANDed with the Start/Stop latch output. This prevents instability during reset by disabling the K4 drive.

LSI/ZIF Column Protection

The protection circuitry provides warning and power removal capability for temperature and power-related faults. Power removal may occur immediately or after a time delay. The method of power removal depends on the type of fault and there are redundant power removal circuits. However, all faults cause activation of the K3 fault relay. The following information assumes that the system is operating in remote power application mode. Section 2, Operation, contains illustrations of the fault indicators.

LSI/ZIF Column Fault Relay

When a fault condition occurs, fault relay K3 initiates power removal from the column. A fault condition causes K3 to latch to fault mode. The Col On relay K4 then deenergizes causing CB1 in the power distribution circuitry to trip. This removes the 400-Hz input and logic power goes down. Only a manual reset function clears K3 and enables power-up (if no faults exist). Refer to Power Application in the preceding text for operation of the RMT On relay.

LSI/ZIF Column Primary High Temperature and Chiller Faults

A primary high temperature or chiller fault causes the appropriate LED(s) to light and starts a time delay circuit. A primary high temperature fault occurs when the temperature at a logic panel primary coolant pass (1, 2, 3, 4, or 5)† exceeds a predetermined maximum. For LSI, the maximum is 35 °C (95 °F). The ZIF maximum is 38 °C (100 °F). This fault causes a PRI HIGH TEMP PASS 1, 2, 3, 4, or 5† LED on the temperature-protect board and the PRI HIGH TEMP LED on the transient-protect board to light. A chiller fault indicates a problem in a water cooling unit and lights the Chiller Fault LED on the transient-protect board.

†Pass 5 is not used on ZIF columns.

A primary high temperature or chiller fault starts the 2.5-second delay on the power control board and activates short warning relay K6. Contacts K6B apply the Short Warning signal to the interbay monitor. If the fault persists after the delay times-out, relay K3 latches in fault mode, and the temperature fault latch signal goes high. K3 initiates power removal as described under Fault Relay in the previous text. Temperature fault latch causes the LEDs to hold the fault information until cleared.

LSI/ZIF Column Cable and Power Supply Off Faults

A cable or power supply off fault lights the appropriate LED on the transient-protect board and initiates power removal immediately upon fault detection. The Cable Fault signal goes to ground when there is an open in the cable fault loop (COL PWR-2 and COL PWR-3). The Power Supply Off signal goes to ground when CB3 or CB4 in the power distribution circuitry trip. Cable Fault or PWR SPLY Off being at ground activates the K6 short warning relay, forces the temperature fault latch signal to low, and latches relay K3 to fault mode. Contact K6B causes the Short Warning signal to appear at the interbay monitor board. Temperature fault latch causes the LEDs to hold the fault information until cleared. K3 initiates power removal as described under Fault Relay.

LSI/ZIF Column 2.2-V and 4.7-V Faults

Sense circuitry on the transient-protect board monitors the logic buses. If the -4.7 V or -2.7 V overvoltage or overcurrent sense signals detect a voltage or current transient on the buses supplying logic panels A through D, the following occur:

- The 4.7-V FAULT or 2.2-V FAULT LED on the transient-protect board lights.
- The Short Logic PS (power supply) and SEC 400-Hz DSBL (disable) 1 signals activate. Short Logic PS generates Short 4.7-V and Short 2.7 V. These signals turn on SCRs connected across the -4.7 V and -2.7 V outputs causing the outputs to short to ground during transient conditions. SEC 400-Hz DSBL causes power removal via K2 in the power distribution circuitry.
- The PS + BU (back-up) Temp Fault 1 and 2 signals activate. PS + BU Temp Fault 1 energizes BU fault relay K8 in the power control board. The 4.7 V DSBL and 2.7 V DSBL signals then remove 400-Hz by tripping CB3 and CB4 in the power distribution circuitry. PS + BU Temp Fault 2 latches fault relay K3 to fault mode. This initiates power removal as described under Fault Relay.

LSI/ZIF Column BU High Temperature Fault

A BU High Temp Pass 1, 2, 3, 4, or 5† LED on the temperature-protect board and the BU High Temp LED on the transient-protect board light when the temperature at a back-up pass (1, 2, 3, 4, or 5)† reaches a predetermined maximum. For LSI, the maximum is 40 °C (104 °F). The ZIF maximum is 45 °C (117 °F). A back-up high temperature fault generates the S WRN signal and starts the 2.5-second delay on the transient-protect board. S WRN energizes short warning relay K6 on the power-control board causing a S WRN signal to appear at the interbay monitor. If the fault is present when the delay times-out, the PS + BU Temp Fault 1 and 2 and BU Fault LCH signals activate.

---

† Pass 5 is not used on ZIF columns.

PS + BU Temp Fault 1 energizes back-up fault relay K8 on the power-control board. The 4.7 V DSBL and 2.7 V DSBL signals then trip CB3 and CB4 causing removal of 400-Hz power. PS + BU Temp Fault 2 energizes fault relay K3 which initiates power removal as discussed under Fault Relay. BU Fault LCH causes the LEDs on the temperature-protect board to hold the fault information until cleared.

LSI/ZIF Column BU Low Temperature Fault

A BU low temperature fault occurs when dew forms on the column input water line. When the Dewpoint signal goes active, the long warning relay on the power control board energizes. The L WRN signal then appears at the interbay monitor. Dewpoint going active also starts a 100-second delay on the transient-protect board. If Dewpoint is active when the delay times-out, the following occur:

- The BU LOW TEMP LED lights.
- The S WRN signal energizes short warning relay K6 on the power-control board causing the S WRN signal to appear at the interbay monitor board.
- A 2.5-second delay on the transient-protect board activates. If Dewpoint is present when the delay times-out, PS + BU Temp Fault 1 and 2 go active. PS + BU Temp Fault 1 energizes BU fault relay K8 on the power-control board. 2.7 V DSBL and 4.7 V DSBL then trip CB3 and CB4 thus removing 400-Hz power. PS + BU Temp Fault 2 causes relay K3 to latch in fault mode. This initiates power removal as described under Fault Relay.

LSI Column -2.2 V Regulator Fault

Circuits in the -2.2 V regulator monitor its operation. When an OV (overvoltage), OVCUR (overcurrent), or undercurrent condition occurs, the appropriate LED on the regulator board lights and the 2.2 DSBL signal goes active. 2.2 V DSBL generates 2.7 V DSBL and 4.7 V DSBL which trip CB3 and CB4 in the power distribution circuitry thereby removing 400-Hz power. Tripping CB3 and CB4 causes a power supply off fault which results in relay K3 latching to fault mode.

NOTE

ZIF columns do not have -2.2 V regulator boards.

COLUMN (1-32)
4

NOTES:
1. ZIF COLUMNS (WHEN IN SYSTEM) DO NOT HAVE REGULATORS.
2. THIS COL ON OUTPUT NOT USED.
3. START/STOP SIGNALS ARE NOT USED IN THIS APPLICATION.
4. THIS DIAGRAM REPRESENTS ONE COLUMN. A SYSTEM CAN HAVE UP TO 32 COLUMNS.
5. -12 V ORIGINATES ON POWER CONTROL BOARD.
6. REFER TO DIAGRAM 2.0.

POWER DISTRIBUTION BOX A5

POWER CONTROL BOARD A1

-2.7 V, -4.7 V

-2.7V (PWR SPLY 1), -4.7V (PWR SPLY 2)

PS + BACK UP TEMP FAULT 1

K8 BACK UP FAULT

-18 V

ISOLATION

4.7 DSBL

2.7 DSBL

PRI HIGH TEMP BU HIGH TEMP -2.2 V DSBL

-2.2 V DSBL

BU HIGH TEMP

PRI HIGH TEMP

CA FAULT

PRI HIGH TEMP, CHILLER FAULT, CA FAULT, PWR SPLY OFF, BU HIGH TEMP

CHILLER CONT. COL 1-16, CHILLER CONT. COL 17-32 (CHILLER FAULT)

CHILLER CONT. COL 1-16 OR CHILLER CONT. COL 17-32 (CHILLER FAULT), RMT ON

DELAY 2.5 SEC

PWR SPLY OFF

COL ON

K4 COL ON

FAULT

K3

K4A

S WRN, L WRN

S WRN

L WRN

K6 S WRN

K5 L WRN

PS + BU TEMP FAULT 2

START, STOP

START STOP

LCH CKT

RMT

S4A

LCL

PWR ON RESET CKT

RESET CKT

RESET

K3 FAULT (LCH)

TEMP FAULT LCH

K3 FAULT

-18 V

K1

LOCAL/ REMOTE

RMT ON

K1 REMOTE ON

TEST

S2

PWR SPLY OFF. PWR ON

PWR SPLY OFF

PWR ON

HT SK OV TEMP

RESISTOR

MAIN 400 Hz DSBL

K4 COL ON

K5 L WRN

K6 S WRN

S4C

S4B

PS + BU TEMP FAULT + RESET

TEST

POWER ON

COL ON. L WRN, S WRN

COL ON

SEC 400 Hz DSBL 1

SHORT LOGIC PS

BU FAULT LCH

DRIVER

SEC 400 Hz DSBL 2

SHORT 2.7 V

SHORT 4.7 V

-4.7 OV V A-D. -4.7 OV CUR A-D

4X2

-2.7 OV V A-D. -2.7 OV CUR A-D

2.0

-2.2 V REGULATOR A4 D
-2.2 V REGULATOR A4 C
-2.2 V REGULATOR A4 B
-2.2 V REGULATOR A4 A

AMPL

SHUNT CIRCUIT

-2.2 V A

GND

RES

SENSE & CONTROL CIRCUITRY

-2.2 V DSBL A

LEDS

OVER VOLTAGE

OVER CURRENT

UNDER CURRENT

-12 V

LED

POWER OFF

-2.2 V A-D

-2.2 V BUS

THERM-ISTER CLG PASS 1

CLG PASS 1-5 (PRI)

CLG PASS 1-5 (BU)

4X5

TEMP FAULT LCH, BACKUP FAULT LCH

-2.2 V DSBL A-D

TEMPERATURE PROTECT BOARD A6 D
TEMPERATURE PROTECT BOARD A6 C
TEMPERATURE PROTECT BOARD A6 B
TEMPERATURE PROTECT BOARD A6 A

PASS 1-5 (PRI)

TEMP FAULT LCH

BACK UP FAULT LCH

PASS 1-5 (BU)

PRI TEMP SENSE & CONTROL CIRCUITRY

BACK UP TEMP SENSE & CONTROL CIRCUITS

PRI HIGH TEMP PASS 1,2,3,4,5

PRI HIGH TEMP

BU HIGH TEMP

BACK UP HIGH TEMP PASS 1,2,3,4,5

PRI HIGH TEMP, BU HIGH TEMP, -2.2 V DSBL

COL ON. S WRN, L WRN, PWR SPLY 1, PWR SPLY 2

2.3, 2.4

DEW POINT SENSOR

DEW POINT

TRANSIENT PROTECT BOARD A2

BACK UP HIGH TEMP

TIME DELAY (100 SEC)

BACK UP LOW TEMP

L WRN

S WRN

TEST

ISOLATION

SENSE CIRCUITRY

4.7 V FAULT

TIME DELAY (2.5 SEC)

2.2 V FAULT

SEC 400 Hz DSBL 1

SHORT LOGIC PS

PS + BU TEMP FAULT 1

PS + BU TEMP FAULT 2

BU FAULT LCH

PS + BU TEMP FAULT 1. PS + BU TEMP FAULT 2. BU FAULT LCH

POWER ON

POWER ON RESET

CHILLER FAULT

PRI HIGH TEMP

POWER SUPPLY OFF

CABLE FAULT

IN WATER TEMP

OUT WATER TEMP

IN TEMP

OUT TEMP

WATER TEMP SENSORS

COL ON. SEC 400 Hz DSBL 2. MAIN 400 Hz DSBL. 4.7 DSBL. 2.7 DSBL

SHORT 2.7 V. SHORT 4.7 V

4.7 DSBL. 2.7 DSBL

L WRN, S WRN, SEC 400 Hz DSBL 1, SHORT LOGIC PS, PS + BU TEMP FAULT 1, PS + BU TEMP FAULT 2, BU FAULT LCH

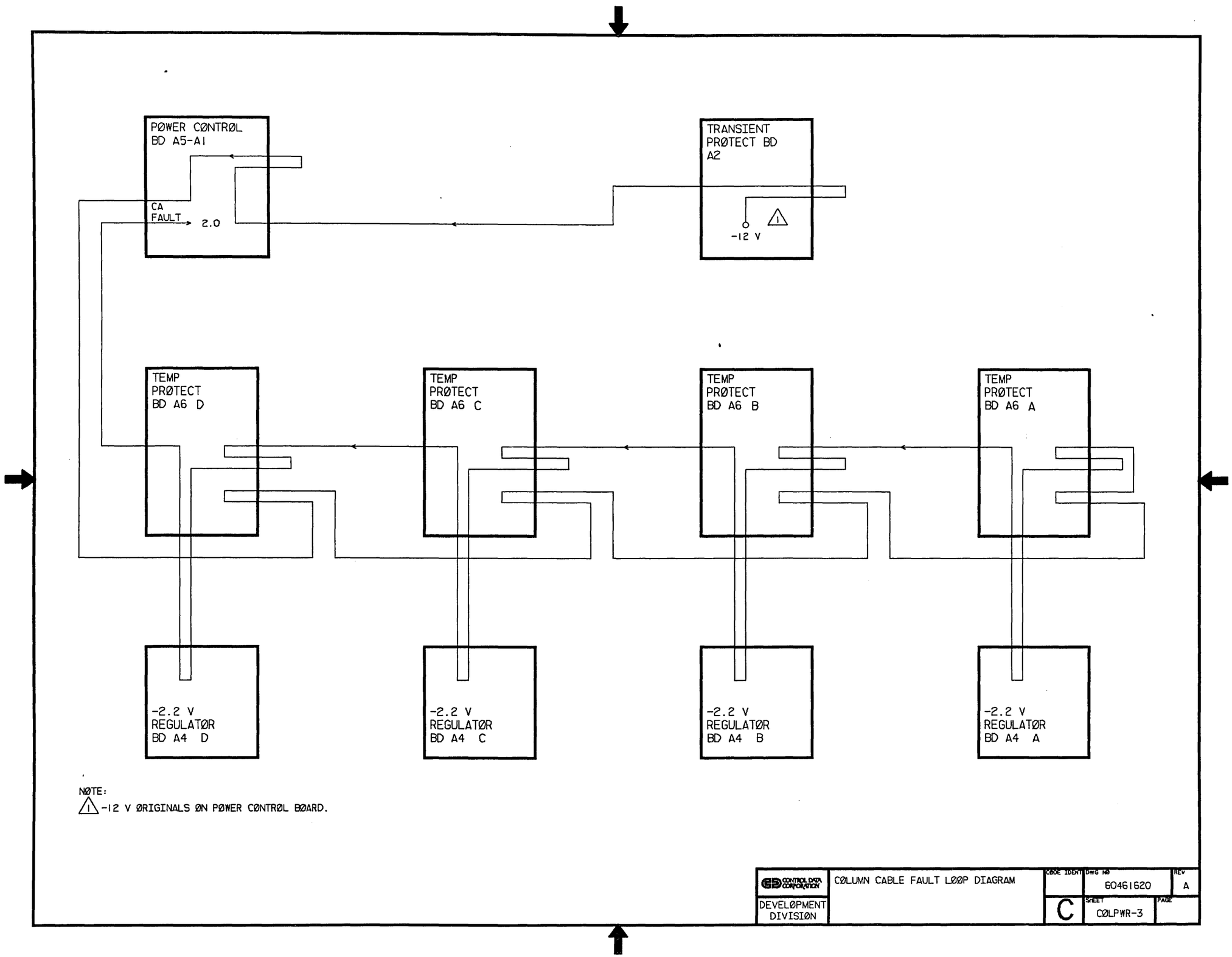
DEVELOPMENT DIVISION

LSI/ZIF COLUMN CONTROL/PROTECTION

60461620

A

COLPWR-2



NØTE:
1 -12 V ØRIGINALS ØN PØWER CØNTRØL BØARD.

CONTROL DATA CORPORATION	CØLUMN CABLE FAULT LØØP DIAGRAM	CØDE IDENT	DWG NØ 60461620	REV A
DEVELØPMENT DIVISIØN		C	SHEET CØLPWR-3	PAGE

CABINET WIRING (DC POWER DISTRIBUTION AND FAULTS)

The Cabinet Wiring Diagram (CAB WIR-1) shows the dc power distribution and associated fault and temperature detect signals. Refer to diagrams CAB WIR-2 through CAB WIR-5 for additional column-related diagrams.

DC Power Distribution

T1, CR1 through CR12, and C1 through C4 comprise the -4.7 V ac to dc converter. The -4.7 V output goes to a bus which feeds the logic panels in rows A, B, C, and D. The -2.7 V ac to dc converter is composed of T2 and CR13 through CR24. The 2.7 V output goes to a bus which feeds four -2.2 V shunt regulators, one for each logic row.† Capacitors are not required on the -2.7 V bus because the shunt regulators draw a relatively constant current. Thus, a choke which is built into T2 is sufficient to reduce ripple.

Fault Signals

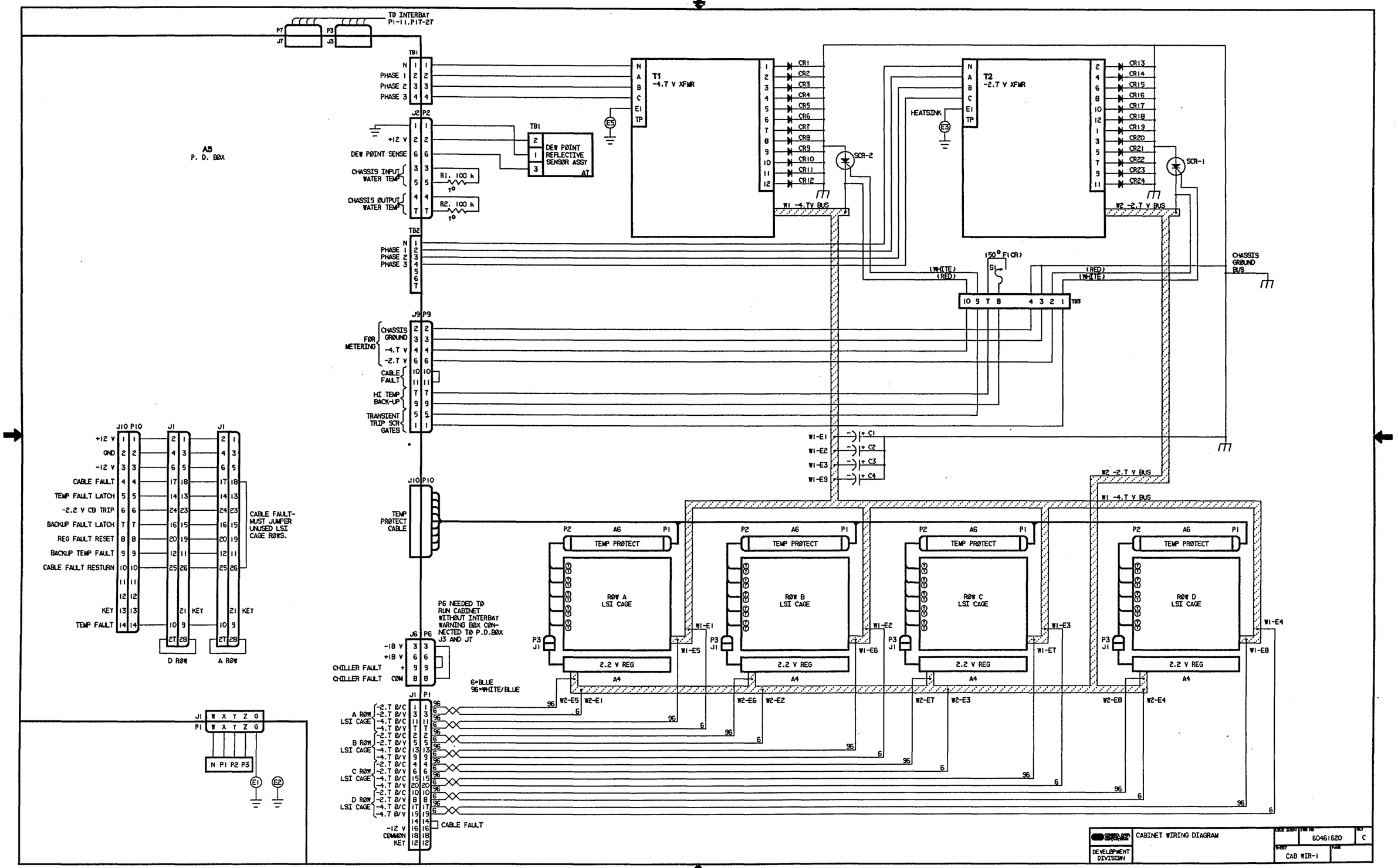
The fault signals are:

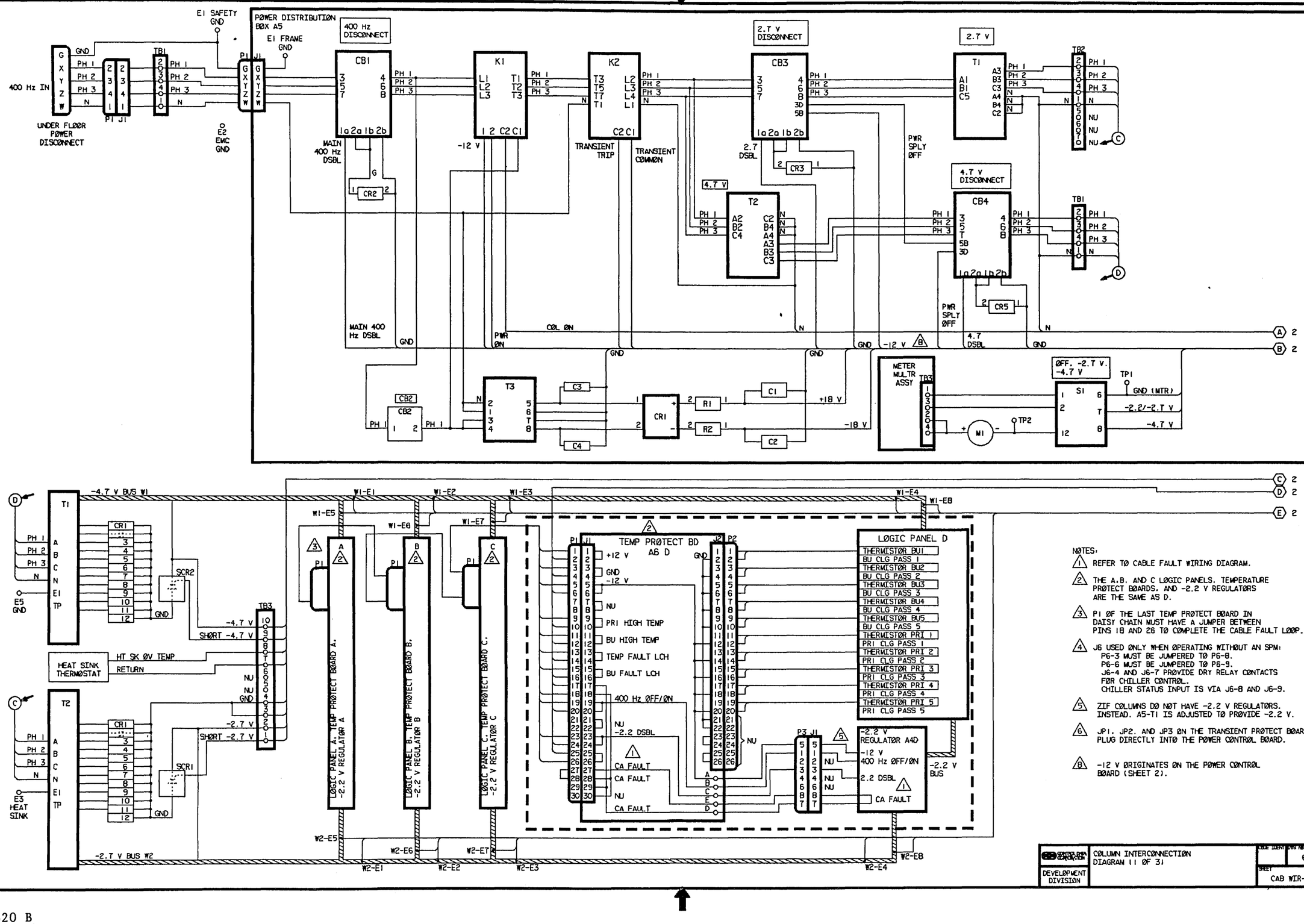
- Cable Fault (J1-14/16 and J9-10/11) - Drives a circuit in the power control board which causes removal of 400-Hz power if there is an open in the cable fault loop.
- HT SK OV TEMP (heat sink over temperature) (J9-7/9) - Drives a fault circuit in the power control board which causes removal of 400-Hz power if the heat sink thermostat opens (temperature rises over 54.4 ^{o}C (130 ^{o}F).
- 4.7 SCR DSBL and 2.7 SCR DSBL (J9-1/5) - These signals come from the power-control board and turn on SCR1 and SCR2 which short the outputs to ground if the transient-protect board detects transients in the -4.7 V or -2.7 V logic power supply outputs.
- -4.7 Voltage Sense, -4.7 Current Sense, -2.7 Voltage Sense, and -2.7 Current Sense (J1-1 through 11/13/15/17/19) - Drives fault circuits in the transient-protect board. Removes logic power if faults occur in the -4.7 V or -2.2 V power supplies or loads.
- Temp Protect (J10) - Drive the fault detect circuits in the temperature-protect board which removes power if an overtemperature condition occurs.

Temperature Detect Signals

- Chassis Input Water Temp (J2-3/5) - Drives test point circuit on transient-protect board.
- Chassis Output Water Temp (J2-4/7) - Drives test point circuit on transient-protect board.

† ZIF columns do not have -2.2 V regulators. Instead, the -2.7 V output is adjusted to -2.2 V and used directly.


TØ INTERBAY
P1-11,P17-27
P7
J7
P3
J3
A5
P. D. BØX
TB1
N
PHASE 1
PHASE 2
PHASE 3
J2 P2
+12 V
DEW PØINT SENSE
CHASSIS INPUT WATER TEMP
CHASSIS ØUTPUT WATER TEMP
R1, 100 k
TØ
R2, 100 k
TØ
TB1
DEW PØINT REFLECTIVE SENSØR ASSY
AT
T1
-4.7 V XFMR
T2
-2.7 V XFMR
HEATSINK
E5
E3
SCR-2
SCR-1
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
CR13
CR14
CR15
CR16
CR17
CR18
CR19
CR20
CR21
CR22
CR23
CR24
W1 -4.7V BUS
W2 -2.7 V BUS
TB2
J9 P9
FØR METERING
CHASSIS GRØUND
-4.7 V
-2.7 V
CABLE FAULT
HI TEMP BACK-UP
TRANSIENT TRIP SCR GATES
150° F(CR)
S1
(WHITE)
(RED)
TB3
CHASSIS GRØUND BUS
W1-E1
W1-E2
W1-E3
W1-E4
C1
C2
C3
C4
J10 P10
+12 V
GND
-12 V
CABLE FAULT
TEMP FAULT LATCH
-2.2 V CB TRIP
BACKUP FAULT LATCH
REG FAULT RESET
BACKUP TEMP FAULT
CABLE FAULT RESTURN
KEY
TEMP FAULT
J1
J1
CABLE FAULT-MUST JUMPER UNUSED LSI CAGE RØWS.
D RØW
A RØW
TEMP PRØTECT CABLE
J10 P10
P6 NEEDED TØ RUN CABINET WITHØUT INTERBAY WARNING BØX CØNNECTED TØ P.D.BØX J3 AND J7
J6 P6
-18 V
+18 V
CHILLER FAULT +
CHILLER FAULT CØM
6=BLUE
96=WHITE/BLUE
J1 P1
A RØW LSI CAGE
B RØW LSI CAGE
C RØW LSI CAGE
D RØW LSI CAGE
-2.7 Ø/C
-2.7 Ø/V
-4.7 Ø/C
-4.7 Ø/V
-12 V COMMØN
KEY
CABLE FAULT
J1 W X Y Z G
P1 W X Y Z G
N P1 P2 P3
E1
E2
P2 A6 P1
TEMP PRØTECT
RØW A LSI CAGE
RØW B LSI CAGE
RØW C LSI CAGE
RØW D LSI CAGE
2.2 V REG
A4
P3 J1
W1-E5
W1-E6
W1-E7
W1-E8
W2-E5
W2-E1
W2-E6
W2-E2
W2-E7
W2-E3
W2-E8
W2-E4
CABINET WIRING DIAGRAM
DEVELOPMENT DIVISION
60461620
C
CAB WIR-1


EI SAFETY GND
PØWER DISTRIBUTIØN BØX A5
EI FRAME GND
400 Hz DISCØNNECT
2.7 V DISCØNNECT
2.7 V
4.7 V DISCØNNECT
400 Hz IN
UNDER FLØØR PØWER DISCØNNECT
E2 EMC GND
CB1
K1
K2
CB3
T1
TB2
TB1
MAIN 400 Hz DSBL
-12 V
TRANSIENT TRIP
TRANSIENT CØMMØN
2.7 DSBL
PWR SPLY ØFF
CR3
CR2
T2
CB4
CR5
MAIN 400 Hz DSBL
PWR ØN
CØL ØN
4.7 DSBL
T3
CB2
C1
C2
C3
C4
R1
R2
CR1
+18 V
-18 V
METER MULTR ASSY
TB3
MI
TP2
ØFF. -2.7 V. -4.7 V
S1
TP1
GND (MTR)
-2.2/-2.7 V
-4.7 V
-4.7 V BUS W1
W1-E1
W1-E2
W1-E3
W1-E4
W1-E5
W1-E6
W1-E7
W1-E8
T1
T2
CR1
SCR2
SCR1
TB3
-4.7 V
SHØRT -4.7 V
-2.7 V
SHØRT -2.7 V
HEAT SINK THERMØSTAT
HT SK ØV TEMP
RETURN
E5 GND
E3 HEAT SINK
LØGIC PANEL A, TEMP PRØTECT BØARD A, -2.2 V REGULATØR A
LØGIC PANEL B, TEMP PRØTECT BØARD B, -2.2 V REGULATØR B
LØGIC PANEL C, TEMP PRØTECT BØARD C, -2.2 V REGULATØR C
TEMP PRØTECT BD A6 D
+12 V
GND
-12 V
PRI HIGH TEMP
BU HIGH TEMP
TEMP FAULT LCH
BU FAULT LCH
400 Hz ØFF/ØN
-2.2 DSBL
CA FAULT
LØGIC PANEL D
THERMISTØR BU1
BU CLG PASS 1
THERMISTØR BU2
BU CLG PASS 2
THERMISTØR BU3
BU CLG PASS 3
THERMISTØR BU4
BU CLG PASS 4
THERMISTØR BU5
BU CLG PASS 5
THERMISTØR PRI 1
PRI CLG PASS 1
THERMISTØR PRI 2
PRI CLG PASS 2
THERMISTØR PRI 3
PRI CLG PASS 3
THERMISTØR PRI 4
PRI CLG PASS 4
THERMISTØR PRI 5
PRI CLG PASS 5
-2.2 V REGULATØR A4D
-12 V
400 Hz ØFF/ØN
2.2 DSBL
-2.2 V BUS
NØTES:
1. REFER TØ CABLE FAULT WIRING DIAGRAM.
2. THE A,B, AND C LØGIC PANELS, TEMPERATURE PRØTECT BØARDS, AND -2.2 V REGULATØRS ARE THE SAME AS D.
3. P1 ØF THE LAST TEMP PRØTECT BØARD IN DAISY CHAIN MUST HAVE A JUMPER BETWEEN PINS 18 AND 26 TØ CØMPLETE THE CABLE FAULT LØØP.
4. J6 USED ØNLY WHEN ØPERATING WITHØUT AN SPM:
P6-3 MUST BE JUMPERED TØ P6-8.
P6-6 MUST BE JUMPERED TØ P6-9.
J6-4 AND J6-7 PRØVIDE DRY RELAY CØNTACTS FØR CHILLER CØNTRØL.
CHILLER STATUS INPUT IS VIA J6-8 AND J6-9.
5. ZIF CØLUMNS DØ NØT HAVE -2.2 V REGULATØRS. INSTEAD, A5-T1 IS ADJUSTED TØ PRØVIDE -2.2 V.
6. JP1, JP2, AND JP3 ØN THE TRANSIENT PRØTECT BØARD PLUG DIRECTLY INTØ THE PØWER CØNTRØL BØARD.
8. -12 V ØRIGINATES ØN THE PØWER CØNTRØL BØARD (SHEET 2).
CØLUMN INTERCØNNECTIØN DIAGRAM 1 ØF 3
DEVELØPMENT DIVISION
60461620
A
CAB WIR-2

POWER DISTRIBUTION BOX A5

POWER CONTROL BOARD A1

P4 J4
1 NU
2 COL ON
3 NU
4 N

P8 J8
1 -2.7 DSBL
2 -4.7 DSBL
3 GND
4 PWR SPLY OFF
5 -12 V (SOURCE)
6 MAIN 400 Hz DSBL
7 +18 V
8 TRANSIENT COMMON
9 TRANSIENT TRIP
10 PWR ON
11 GND
12 -18 V
13 -4.7 V
14 -2.2/-2.7 V
15 GND

P9 J9
1 SHORT -2.7 V
2 GND
3 GND
4 -4.7 V
5 SHORT -4.7 V
6 -2.7 V
7 HT SK 0V TEMP RTN
8 NU
9 HT SK 0V TEMP
10 CA FAULT
11 CA FAULT ⚠1
12 NU

P10 J10
1 +12 V (SOURCE)
2 GND
3 -12 V (SOURCE)
4 CA FAULT
5 TEMP FAULT LCH
6 -2.2 DSBL
7 BU FAULT LCH
8 FAULT RESET
9 BU HIGH TEMP
10 CA FAULT
11 NU
12 NU
13 KEY
14 PRI HIGH TEMP

J3 P3
1 L WRN
2 S WRN
3 S WRN (GND)
4 GND
5 NU
6 L WRN (GND)
7 GND
8 STOP
9 START
10 NU
11 COL ON
12 COL ON (GND)

J7 P7
1 GND
2 S WRN
3 CHILLER CONT. COL 1-16 OR 17-32
4 GND
5 L WRN
6 RMT ON
7 S WRN
8 L WRN
9 COL ON
10 COL ON
11 S WRN
12 CHILLER CONT. COL 1-16 OR 17-32
13 -2.7/-4.7 RTN
14 -4.7 V
15 -2.7 V

4

J5 P5
1 NU
2 NU
3 -18 V
4 CHILLER OFF/ON C
5 GND
6 +18 V
7 CHILLER OFF/ON C
8 CHILLER ON C RTN
9 CHILLER ON C

WATER COOLING UNIT

6

TRANSIENT PROTECT BOARD A2

JP1 JP1
1 CA FAULT ⚠1
2 CHILLER FAULT
3 S WRN
4 PRI HIGH TEMP
5 L WRN
6 PWR SPLY OFF
7 CABLE FAULT
8 PS + BU TEMP FAULT + RESET
9 PS + BU TEMP FAULT I
10 BACK UP FAULT LCH
11 BACK UP HIGH TEMP
12 NU
13 +12 V
14 +12 V

JP2 JP2
1 -12 V
2 NU
3 NU
4 GND
5 GND
6 NU
7 NU
8 TEST
9 NU
10 C95
11 C90
12 C92
13 NU
14 -12 V

P1 J1
1 -2.7 OV CUR A (W2-E5)
2 -2.7 OV CUR B (W2-E6)
3 -2.7 OV V A (W2-E1)
4 -2.7 OV CUR C (W2-E7)
5 -2.7 OV V B (W2-E2)
6 -2.7 OV V C (W2-E3)
7 -4.7 OV V A (W1-E1)
8 -2.7 OV V D (W2-E4)
9 -4.7 OV V B (W1-E2)
10 -2.7 OV CUR D (W2-E8)
11 -4.7 OV CUR A (W1-E5)
12 KEY
13 -4.7 OV CUR B (W1-E6)
14 CA FAULT ⚠1
15 -4.7 OV CUR C (W1-E7) ⚠1
16 -12 V (CA FAULT)
17 -4.7 OV CUR D (W1-E8)
18 NU
19 -4.7 OV V D (W1-E4)
20 -4.7 OV V C (W1-E3)

JP3 JP3
1 NU
2 NU
3 NU
4 PS + BU TEMP FAULT 2
5 NU
6 NU
7 NU
8 SHORT LOGIC PS
9 SEC 400 Hz DSBL I
10 NU
11 POWER ON
12 GND
13 GND
14 GND

J2 P2
3 IN WATER TEMP
5 RTN
4 OUT WATER TEMP
7 RTN
1 GND
2 +12 V
6 DEW POINT SENSE
8 KEY

THERMISTOR R1
THERMISTOR R2
DEW POINT SENSOR ASSY A7
1
2
3
TB1

1 A
1 B
1 C
1 D
1 E
⚠1

F 3
G 3

INTERBAY MONITOR BOARD (USED WITH AD115/6)

P1-P12 J1-J12
1 GND (WRN & COL ON)
2 S WRN
3 L WRN
4 COL ON
5 GND (RMT ON)
6 CHILLER CONT. COL 1-16
7 RMT ON
8 CHILLER CONT. COL 1-16
9 PWR SPLY COM 16
10 (PWR SPLY 1)
11 (PWR SPLY 2)
12 KEY
13 GND
14 COL ON LINE

COLUMN 1-12

P1T-P28 J1T-J28
1 GND (WRN & COL ON)
2 S WRN
3 L WRN
4 COL ON
5 GND (RMT ON)
6 CHILLER CONT. COL 17-32
7 RMT ON
8 CHILLER CONT. COL 17-32
9 PWR SPLY COM
10 (PWR SPLY 1)
11 (PWR SPLY 2)
12 KEY
13 GND
14 COL ON LINE

COLUMN 17-28

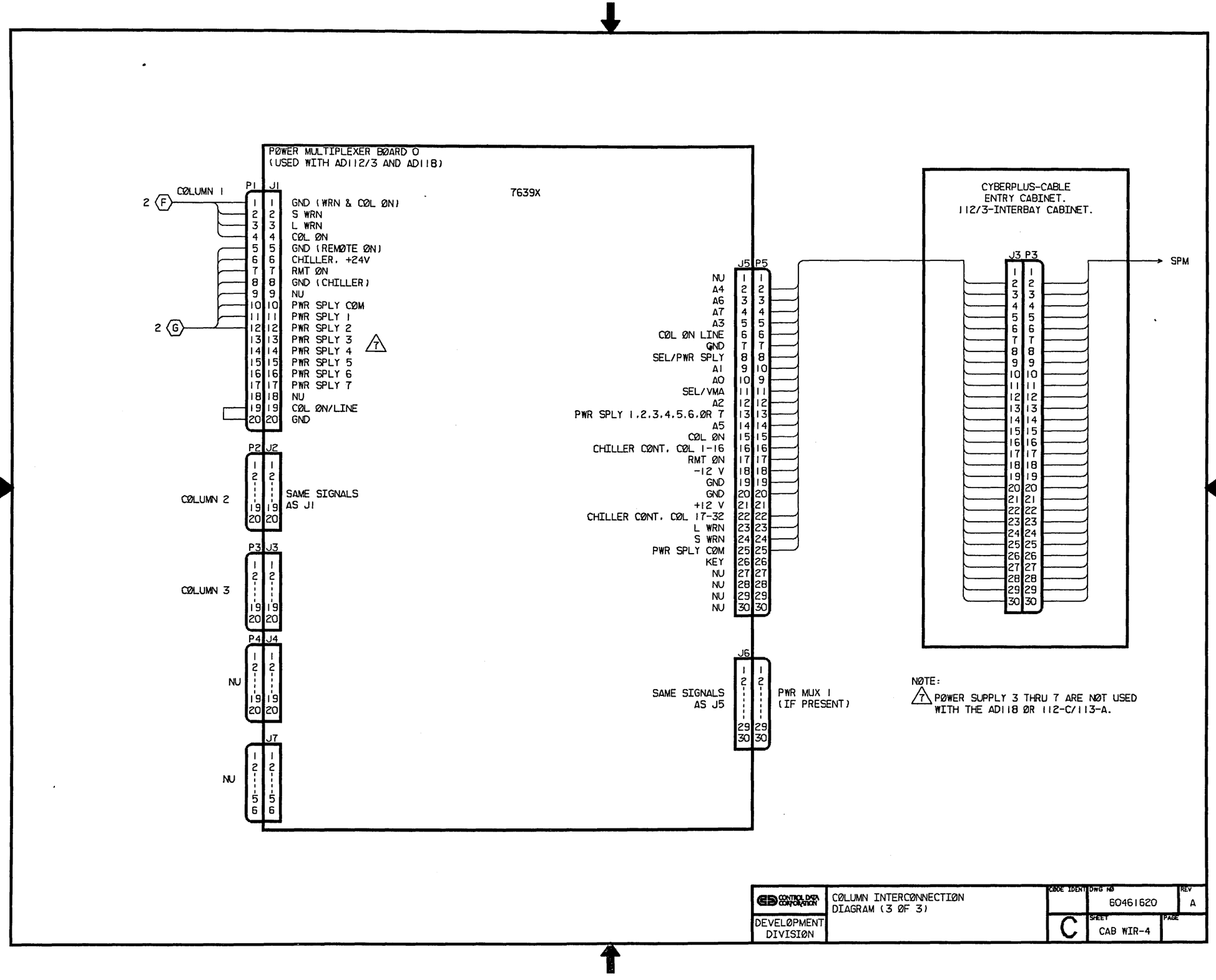
P13-16 P29-32 J13-16 J29-32
1 GND (WRN & 400 Hz OFF/ON)
2 S WRN
3 L WRN
4 400 Hz OFF/ON
5 GND (RMT ON)
6 +24 V DC CHILLER 1 OR CHILLER 2
7 COL OFF/ON
8 GND CHILLER 1 OR CHILLER 2
9 PWR SPLY COM
10 PWR SPLY 1
11 PWR SPLY 2
12 PWR SPLY 3
13 PWR SPLY 4
14 PWR SPLY 5
15 PWR SPLY 6
16 KEY
17 GND
18 COL ON LINE

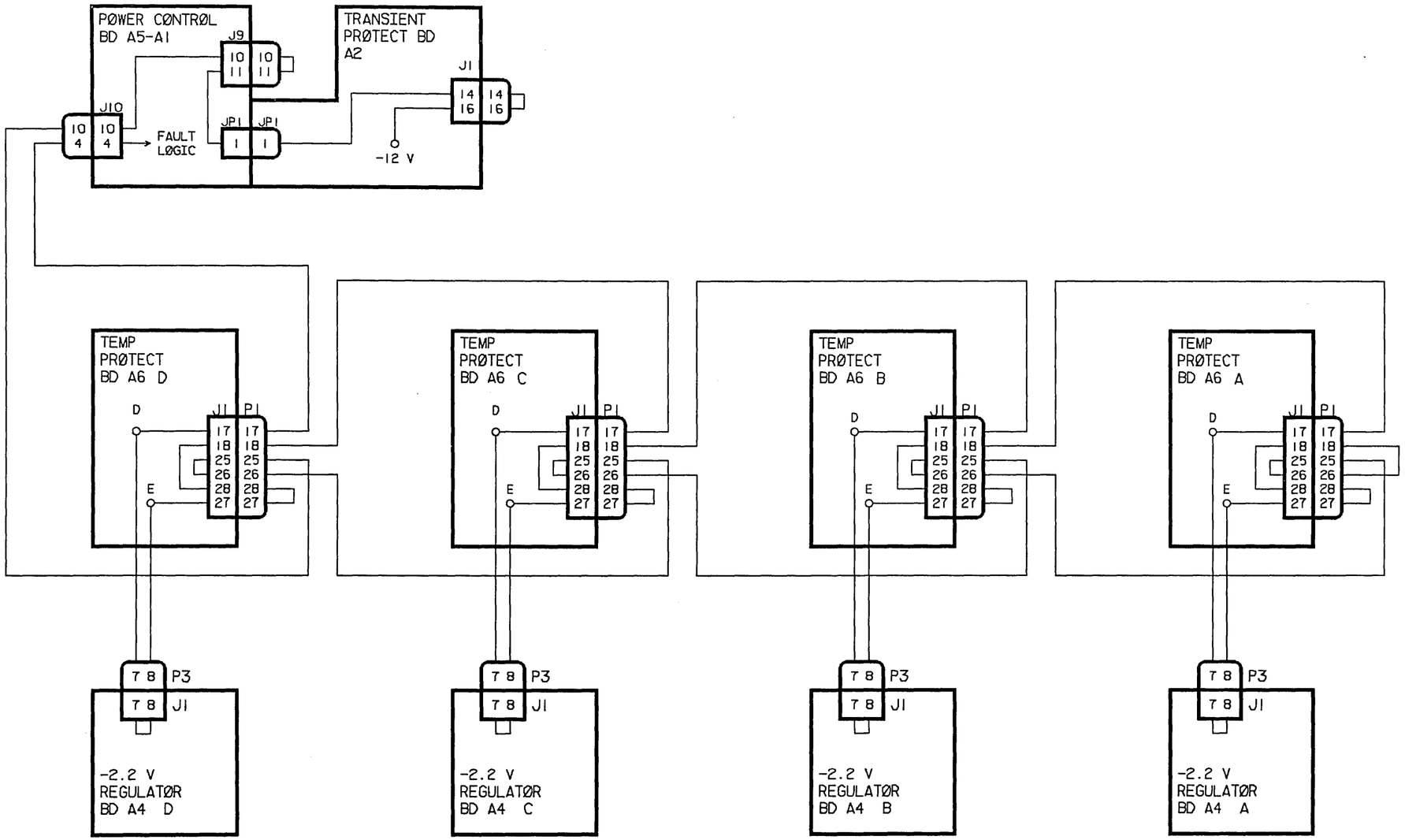
COLUMN 13-16 29-32

J33
1 NU
2 A4
3 A6
4 A7
5 A3
6 COL ON LINE
7 GND
8 SEL/PWR SPLY
9 A1
10 A0
11 SEL/VWA
12 A2
13 PWR SPLY 1-6 INPUT
14 A5
15 COL ON
16 CHILLER CONT. COL 1-16
17 RMT ON
18 -12 V
19 GND
20 GND
21 +12 V
22 CHILLER CONT. COL 17-32
23 L WRN
24 S WRN
25 PWR SPLY COMMON

SPM

CARRIER CORPORATION DEVELOPMENT DIVISION	COLUMN INTERCONNECTION DIAGRAM 12 OF 31	CODE IDENT NO 60461620 REV A
		SHEET CAB WIR-3 SIZE


POWER MULTIPLEXER BOARD 0
(USED WITH AD112/3 AND AD118)
7639X
COLUMN 1
P1 J1
2 F
2 G
1 GND (WRN & COL ON)
2 S WRN
3 L WRN
4 COL ON
5 GND (REMOTE ON)
6 CHILLER, +24V
7 RMT ON
8 GND (CHILLER)
9 NU
10 PWR SPLY COM
11 PWR SPLY 1
12 PWR SPLY 2
13 PWR SPLY 3
14 PWR SPLY 4
15 PWR SPLY 5
16 PWR SPLY 6
17 PWR SPLY 7
18 NU
19 COL ON/LINE
20 GND
7
P2 J2
COLUMN 2
SAME SIGNALS AS J1
P3 J3
COLUMN 3
P4 J4
NU
J7
NU
J5 P5
NU
A4
A6
A7
A3
COL ON LINE
GND
SEL/PWR SPLY
A1
A0
SEL/VMA
A2
PWR SPLY 1,2,3,4,5,6,OR 7
A5
COL ON
CHILLER CONT. COL 1-16
RMT ON
-12 V
GND
GND
+12 V
CHILLER CONT. COL 17-32
L WRN
S WRN
PWR SPLY COM
KEY
NU
NU
NU
NU
J6
SAME SIGNALS AS J5
PWR MUX 1 (IF PRESENT)
CYBERPLUS-CABLE ENTRY CABINET.
I12/3-INTERBAY CABINET.
J3 P3
SPM
NOTE:
7 POWER SUPPLY 3 THRU 7 ARE NOT USED WITH THE AD118 OR 112-C/113-A.
CONTROL DATA CORPORATION
DEVELOPMENT DIVISION
COLUMN INTERCONNECTION DIAGRAM (3 OF 3)
CODE IDENT
C
DWG NO
60461620
REV
A
SHEET
CAB WIR-4
PAGE



CONTROL DATA CORPORATION
DEVELØPMENT DIVISIØN

CABLE FAULT WIRING DIAGRAM

CAGE IDENT: C

DWG NØ: 60461620

REV: A

SHEET: CAB WIR-5

PAGE:

POWER DISTRIBUTION BOX (AC POWER DISTRIBUTION)

AC power distribution drives the ac to dc converters (-4.7 V and -2.7 V) which generate the dc logic power. Control signals from the power control board enable and disable ac power by closing and opening relays and circuit breakers. Status signals to the power control board disable the power-on circuit and indicate circuit conditions. An ac to dc converter for housekeeping power and a meter circuit are also shown. Refer to the LSI (PD BOX-1) and ZIF (PD BOX-2) Power Distribution Box Diagrams.

The 208-V, three-phase, 400-Hz ac follows two paths:

- From the J1 input through CB1, K1, K2, T2, and CB4 to the TB1 output. The TB1 output drives the transformer for the -4.7 V logic power supply.
- From the J1 input through CB1, K1, K2, CB3, and T1 to the TB2 output. The TB2 output drives the transformer for the -2.7 V logic power supply.

The variable transformers, T1 and T2, allow adjustment of the -4.7 V and -2.7 V logic voltages to compensate for ac input variation or for margin checks.

Power is controlled by AC Off/On which is generated by the K4 power relay in the power-control board. This signal controls K1 which opens and closes the 400-Hz ac circuit. AC Off/On occurs when Start/Stop or faults occur. The fault signals are:

- 2.7 AC Disable (P8-1) - Opens CB3 when a back-up -2.7 V logic power fault occurs.
- 4.7 AC Disable (P8-2) - Opens CB4 when a back-up -4.7 V logic power fault occurs.
- Main AC Disable (P8-6) - Opens CB1 when a heat sink over temperature fault occurs because the logic power supply heat sink overheats.

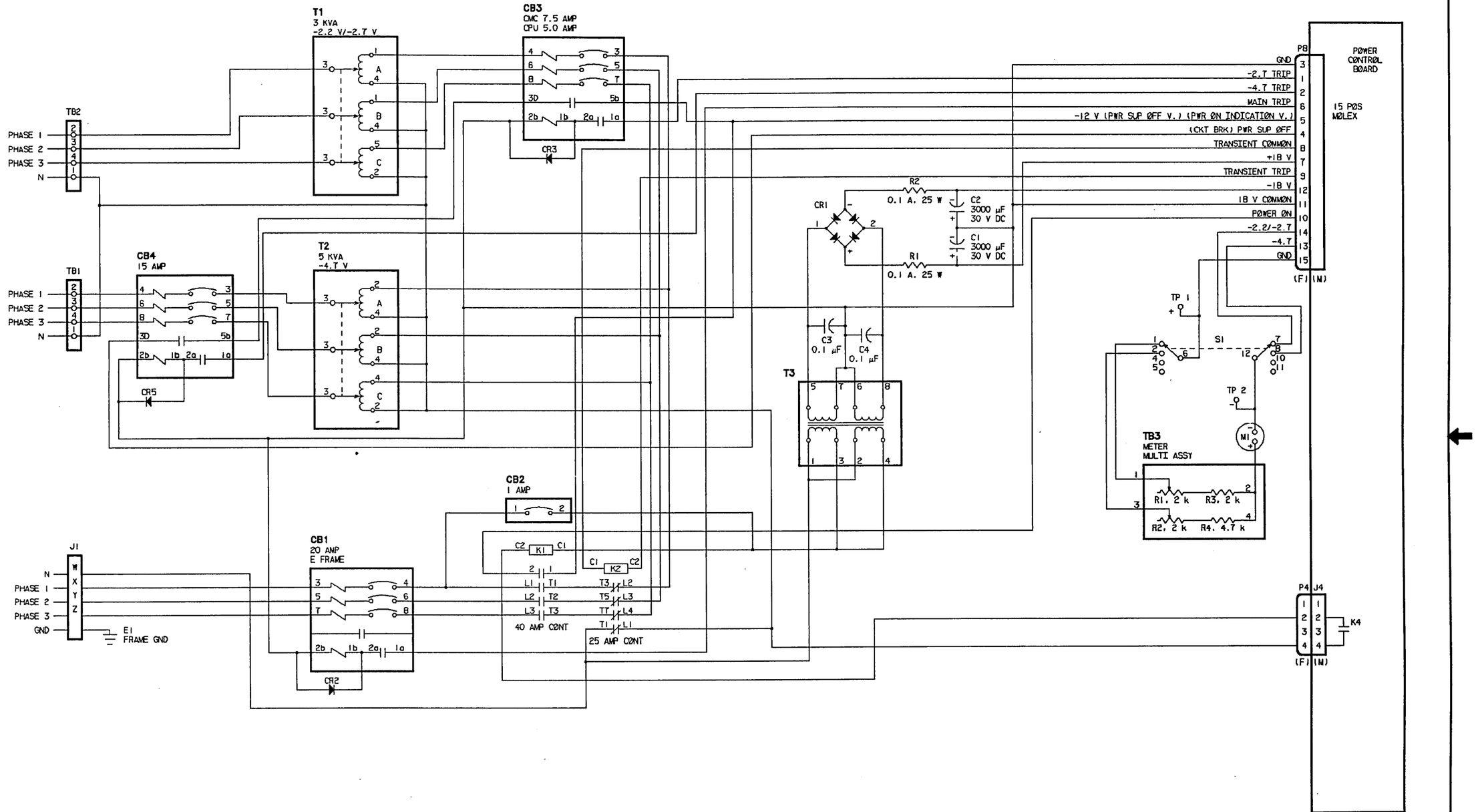
Status signals are:

- PWR SUP OFF (Power Supply Off, P8-4) - When CB3 or CB4 trip, disables the drive to the K4 power relay and latches K3 to fault mode in the power-control board. Also lights the Power Supply Off LED in the transient-protect board.
- PWR ON (Power On, P8-10) - Lights the Power On LED in the transient-protect board when K1 energizes.

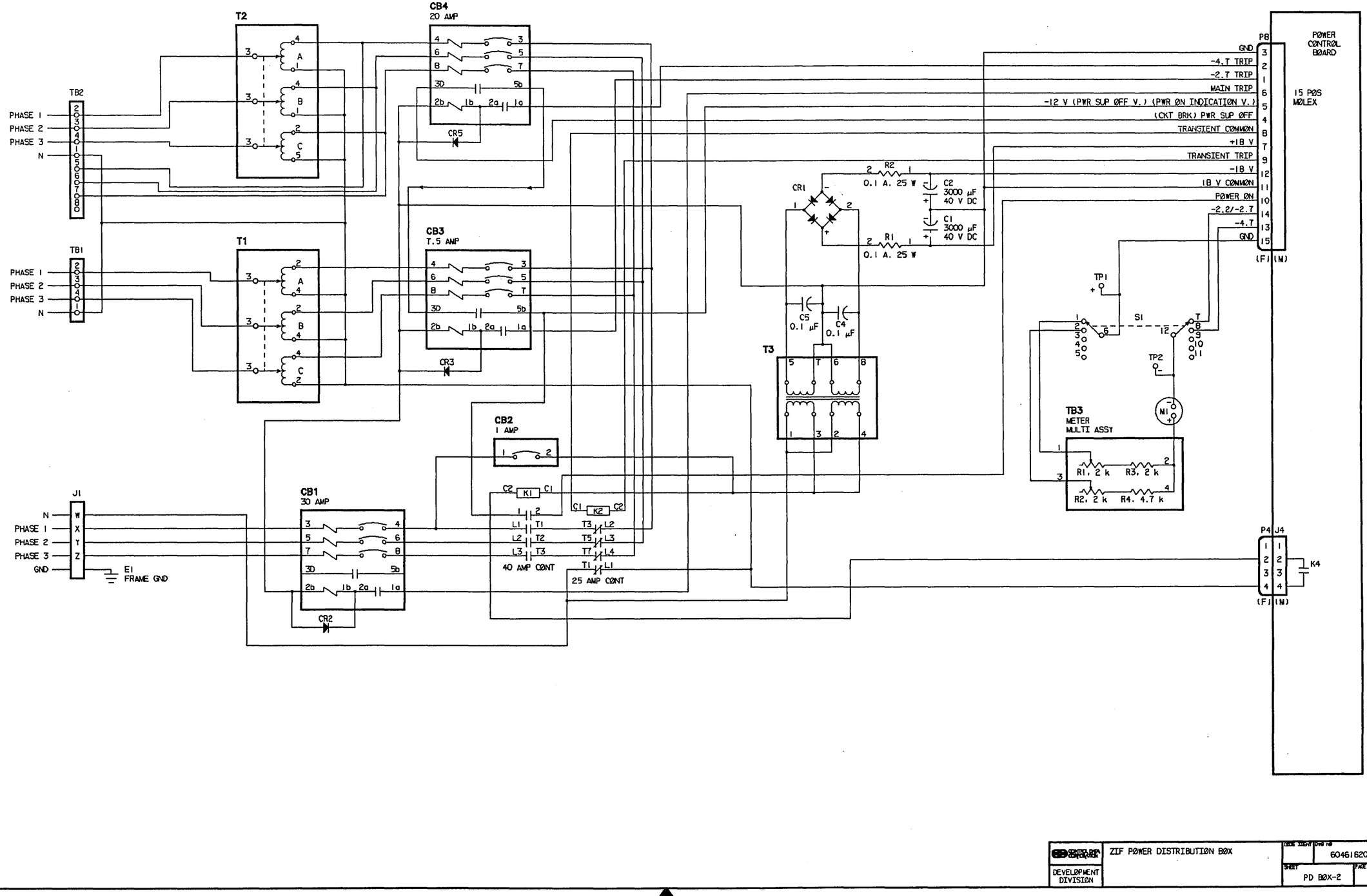
T3, CB1, and C2 provide - 18 V dc for housekeeping power. The meter and switch S1 allow measuring of logic voltages.

NOTE

ZIF columns are wired slightly different than LSI columns. Also, CYBERPLUS ZIF columns have different circuit breakers. Refer to ZIF Power Distribution Box Diagram (PD BOX-2).



CONTROL DATA CORPORATION	LSI POWER DISTRIBUTION BOX	CODE IDENT	DRG NO 60461620 REV C
DEVELOPMENT DIVISION		SHEET PD BOX-1	SIZE



DEVELOPMENT DIVISION	ZIF POWER DISTRIBUTION BOX	60461620	C
		SHEET PD BOX-2	

COLUMN POWER CONTROL BOARD

The column power control board provides power application/removal and fault control capability. Relays and SCRs perform the power control functions. Refer to the Column Power Control Board diagrams (COL PC BD-1 and COL PC BD-2). An overview and more detailed information follows.

Overview

A switch determines local or remote power-off/on. When set to remote, Start/Stop signals from the SPM control the power. If there are no faults, power-on actuates a relay on the power-control board which applies 400-Hz power and sends the Power On signal to the SPM.

Primary and back-up fault circuits relating to temperature, power supply, and cable conditions provide protection. They cause power removal by controlling circuit breakers, relays, and SCRs in the power distribution box when fault conditions occur. Certain faults send warning signals to the SPM and delay the removal of power. Other faults remove power immediately upon detection of a fault condition and do not send warning signals.

Detailed Circuit Information

The following paragraphs provide more detailed information on power-off/on, faults, and reset.

Power Application/Removal

Power-off/on control can be local or remote. When switch S4 is on Local, relay K4 is energized if K3-5/6 are closed (no faults exist). When S4 is on Remote, remote on (J7-6) from the SPM must be active. This energizes K1 closing contacts 8 and 14 and opening contacts 1 and 8. The Start and Stop signals (J3-8/9) from the SPM then control K4 through a latch circuit which drives gate U39-8/9/10. K4 energizing causes:

- K1 in the power distribution box to energize via K4-12/13 (J4-2/4). This closes the 400-Hz power circuit (if no faults exist).
- The Power On signal to go to the SPM via K4-9/10 (J7-9/10) and K4-21/22 (J3-11/12), if in remote mode.

Faults

Primary faults relate to temperature, power supply, and cable conditions. Back-up faults are sensed in the transient-protect board and provide protection in case of failure of the primary fault system. Back-up faults relate to temperature and power supplies.

Primary Faults: The primary faults are primary high temperature, chiller, cable, and power supply off. Active primary fault signals drive related LEDs (on the transient-protect board) via the latch at U28. Primary high temperature and chiller faults generate Short Warn and a delay before removing power, while cable and power supply off faults do not.

The primary high temperature and chiller fault signals are ORed at latch output pins 10/11 and drive K6 and the time delay circuit at U4-8/9/10. This circuit generates the 2.5 second Short Warn delay.† K6-8/9 and 14/15 put Short Warn on lines to the SPM (J3-2/3 and J7-2/11). If the fault persists after 2.5 seconds, the AND gate at U36-11/12/13 activates. This turns off the K4 drive and latches K3 to fault mode. Cable Fault or power supply off fault turn off K4 and set K3 to fault mode via the OR gate at U43-1/11/12 without Short Warn or a time delay. When K3 is in fault mode, contacts 9 and 10 open thereby grounding the stop signal, and contacts 5 and 6 open ensuring that K4 deenergizes. Deenergizing K4 causes:

- K4-6/7 to open and deenergize K5.
- K4-18/19 (J10-8) to open and apply the RGTR Fault Reset signal through the temperature-protect board to the -2.2 V regulator.
- K4-12/13 (J4-2/4) to open and deenergize K2 in the power distribution box. This opens the 400-Hz power input circuit. Housekeeping power remains on.

When a primary fault occurs, the OR gate at U37-11/12/13 sends Temp Fault Latch to the temperature-protect board (J10-5). The OR gate output also drives the clock input of U28 thereby latching the data which drives the fault LEDs.

Back-Up Faults: Back-up fault circuits on the transient-protect board generate power supply fault and back-up fault signals. These back-up signals result from:

-4.7 Overvoltage	-2.2 Overcurrent
-4.7 Overcurrent	Back-Up Low Temperature
-2.2 Overvoltage	Back-Up High Temperature

-4.7 and -2.2 faults remove power directly while the temperature faults generate warnings before removing power.

Power supply fault results from a -4.7 or a -2.2 fault. Power supply fault (JP3-9) generates secondary AC disable and the SCR disable signals. Secondary AC disable (J8-8) deenergizes K2 in the power distribution box. This opens the 400-Hz power circuit but leaves housekeeping power on. 4.7 SCR disable (J9-5) and 2.7 SCR disable (J9-1) turn off the -4.7 V and -2.7 V logic power supplies.

A back-up low temperature fault generates Long Warn (JP1-5). This signal energizes K5 resulting in a Long Warn signal going to the SPM via K5-5/6 and 8/9 (J3-1/6 and J7-5/8). Short Warn (JP1-3) is generated by a back-up low temperature fault or by a back-up high temperature fault. This signal energizes K6. A Short Warn signal then goes to the SPM via K6-8/9 and 14/15 (J3-2/3 and J7-2/11).

† For operation, refer to Time Delays under Transient-Protect Board.

The back-up faults all generate power supply/Back-up Temp Fault and Back-up Fault Latch. Power supply/Back-up Temp Fault (JP1-9) latches K3 in fault mode with the same result described under Primary Faults. In addition, power supply/Back-up Temperature Fault disables the AND gate at U36-1/2/3 and causes reset to go to the transient-protect board (JP1-8). Power supply/Back-up Temperature Fault (JP3-4) energizes K8. 4.7 SCR disable (J9-4) and 2.7 SCR disable (J9-6) then turn off the -4.7 V and -2.7 V logic supplies. K8 also causes the 2.7 AC disable and 4.7 AC disable signals (J8-1,2) to trip CB3 and CB4 in the power distribution box. This opens the 400-Hz input power to the -4.7 V and -2.7 V power supplies. Back-up Fault Latch (JP1-10) goes to the temperature board.

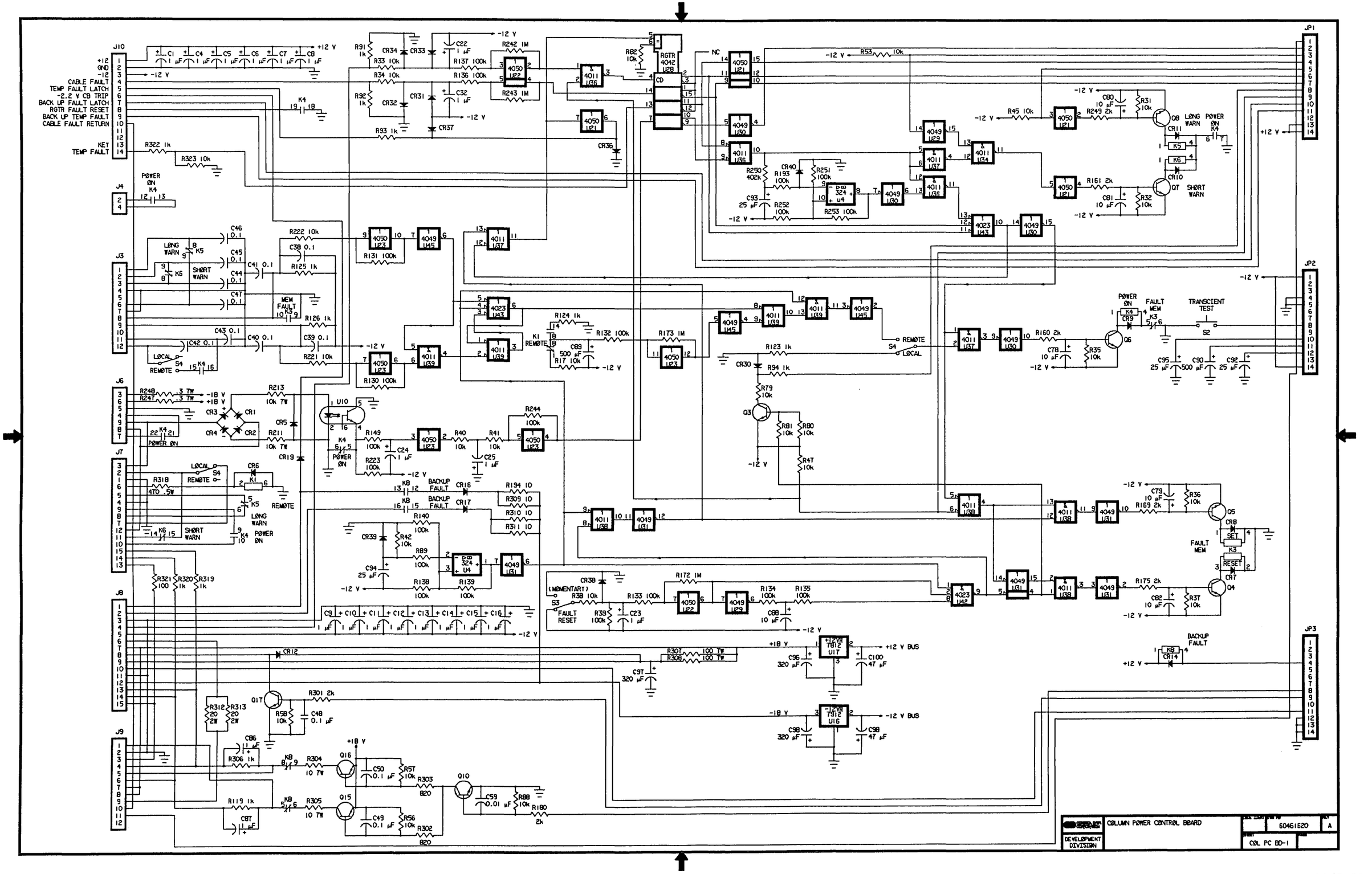
Fault from Temperature Board and Power Distribution Box: -2.2 V disable (J10-6) from the temperature board generates 2.7 AC disable. This trips CB3 in the power distribution box and removes 400-Hz input to the 2.2-V power circuit. Heat sink over temperature (J9-9) activates when the power supply heat sink reaches a predetermined maximum. This causes main AC disable to trip CB1 in the power distribution box thereby removing 400-Hz power. Housekeeping power is removed in this case.

Reset

The column power control board has a power-on reset circuit (U4-1/2/3) and a manual, switch actuated (S3) reset circuit. Both circuits perform certain functions and each have separate functions. The outputs are ORed at U38-8/9/10 so that both power-on and manual reset:

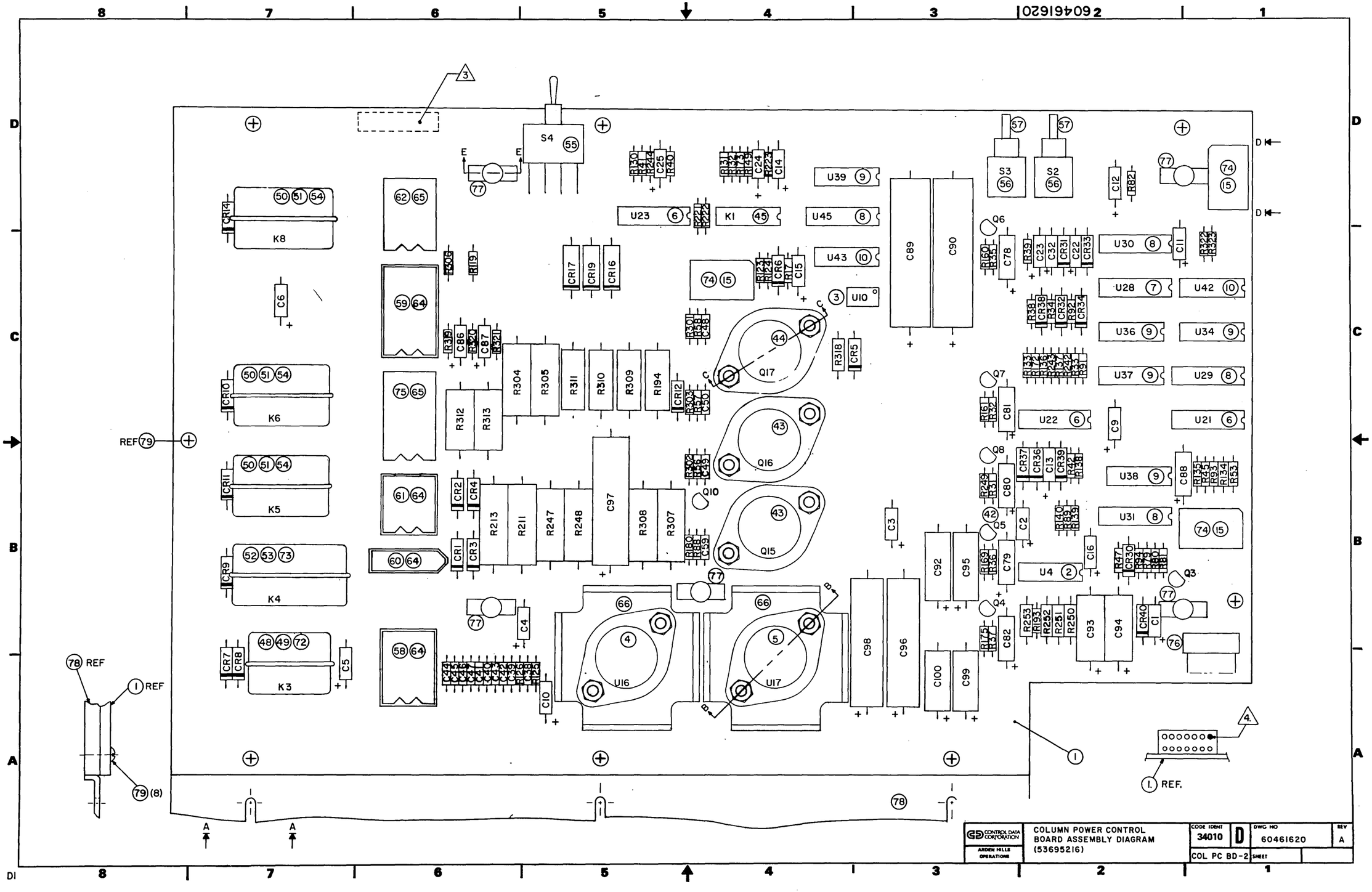
- Cause Temp Fault Latch to go to the temperature-protect board.
- Drive the clock input of the latch at U28 allowing new data to transfer to the fault LEDs on the transient board.
- Disables the AND gate at U38-11/12/13. This disables the K3 set coil during reset.

Power-on reset sets the Start/Stop latch (U43-4) and also goes to pin 12 of the AND gate at U39. This prevents the Start/Stop signals from driving K4 during power-on. Manual reset drives the reset coil K3 through pin 1 of the AND gate at U38 if the fault condition is cleared. Manual reset also generates transient reset to the transient-protect board (JP1-8).



60461620 B

5-93/5-94


S4
K8
K6
K5
K4
K3
K1
K2
S3
S2
Q17
Q16
Q15
U16
U17
Q10
Q6
Q7
Q8
Q5
Q4
Q3
U39
U45
U43
U10
U23
U30
U28
U42
U36
U34
U37
U29
U22
U21
U38
U31
U4
C89
C90
C92
C95
C98
C96
C100
C99
C97
R304
R305
R311
R310
R309
R194
R312
R313
R213
R211
R247
R248
R308
R307
REF 79
78 REF
1 REF
79 (8)
1. REF.
A
A
COLUMN POWER CONTROL BOARD ASSEMBLY DIAGRAM (53695216)
CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
CODE IDENT 34010
D
DWG NO 60461620
REV A
COL PC BD-2
SHEET

TRANSIENT-PROTECT BOARD

The transient-protect board provides back-up low and high temperature fault warning, indicators for certain fault circuits on the power control board, and test points for measuring column input and output water temperature. Refer to Transient-Protect Board diagrams (TP BOARD-1 and TP BOARD-2).

Temperature and Power Supply Faults

Back-up low and high temperature and -4.7 V and -2.2 V faults actuate the fault logic. A back-up low temperature fault occurs when dew forms on the cabinet input water line. When this fault occurs:

- Long warning goes to the system fault logic via the power-control board (JP1-5).
- A 50-second delay generator (U6-12/13/14) starts.

If the 50-second delay times-out and the fault still exists:

- Short warning goes to the system logic via the power-control board (JP1-3).
- A 2.5-second delay generator starts (U7-1/2/3).

If the 2.5-second delay times-out and the fault still exists, the OR gate at U44-1/2/8/9 activates. This OR gate is also activated by a back-up high temperature fault or by a logic power supply fault. A back-up high temperature fault signal comes from the temperature-protect board. It causes short warning and starts the 2.5-second delay. If the fault still exists after 2.5 seconds, the OR gate at U44-1/2/8/9 activates. Faults in the -4.7 V or -2.7 V buses activate the OR gate at U44-1/2/8/9 directly and cause PS fault to appear at the power-control board. 400-Hz input power is then removed and the -4.7 V and -2.7 V power supplies are disabled. Housekeeping power remains on.

Activating the OR gate at U44-1/2/8/9 causes PS/BU temperature fault and back-up fault latch to appear at the power control board. This results in removal of 400-Hz power from the input of the -2.7 V and -4.7 V power supplies. Back-up fault latch can also be generated by the reset signal from the power-control board or by the power-on reset generator (U6-8/9/10).

Indicator and Test Points

Signals from the power control board drive these fault indicators:

CHILLER FAULT	POWER SUPPLY OFF
PRIMARY HIGH TEMP	CABLE FAULT
POWER ON	

Internal signals drive the following fault indicators:

BACK-UP LOW TEMP	-4.7 V FAULT
BACK-UP HIGH TEMP	-2.2 V FAULT

Test points are:

TP1	IN TEMP (column input water temperature)
TP2	OUT TEMP (column output water temperature)
TP3	COMMON

Detailed Circuit Information

The following paragraphs provide more detailed information on transient and water temperature sense, time delays, fault latch, transient test, and reset.

Transient Sense

Voltage comparators, operational amplifiers (op amps), and associated circuitry comprise the -4.7 and -2.2 overvoltage and overcurrent sense circuitry.

The A, B, C, and D logic rows each have associated overvoltage and overcurrent detectors on the transient-protect board. The voltage sense and current sense signals from the -4.7 V and -2.7 V buses drive these detectors. If the -4.7 V bus for the A-row, for example, reaches approximately 6.5-V, the comparator at U12-10/11/13 switches. This results in a -4.7 Fault. If the A-row -2.2 V bus reaches approximately 3.3-V, the comparator at U14-2/4/5 switches and a -2.7 fault occurs. Current is sensed in the buses by connecting differential op amp inputs to two different points on a bus. The op amp drives a comparator. A 10 mV differential on the -4.7 or -2.7 bus causes the comparator to switch and a -4.7 fault or a -2.2 fault occurs. The op amp at U18-12/13/14 is the A-row -4.7 overcurrent detector.

Op amps provide the reference for the comparator circuits. The op amps at U5-5/6/7 and U12-10/11/13 comprise the 6.5-V reference circuit. The op amps at U5-1/2/3 and U5-12/13/14 provide the 3.3-V reference. The 2.5-V regulator at U9 generates a reference voltage for the 6.5-V and 3.3-V reference circuits.

Water Temperature Sense

Op amps provide isolation between the column input and output water temperature sensors and the test points. These circuits are calibrated so that one mV equals one degree centigrade.

Time Delays

The transient-protect board generates long warning and short warning delays. The op amp at U6-12/13/14 generates the 50-second long warning delay. A 66.4K resistor (R297) and a 500 uf capacitor (C90 on the power-control board) determine the delay. When a fault occurs, U25-6 goes high and C90 begins to charge through R297. After approximately 50 seconds, C90 reaches 9 volts. U6-14 then goes low and pulls pin 12 to three volts through R184. Thus, pin 13 must drop to three volts before the op amp output returns to its normal state. This increases circuit stability. The 2.5-second short warning delay circuit (U7-1/2/3) is similar.

Fault Latch and Reset

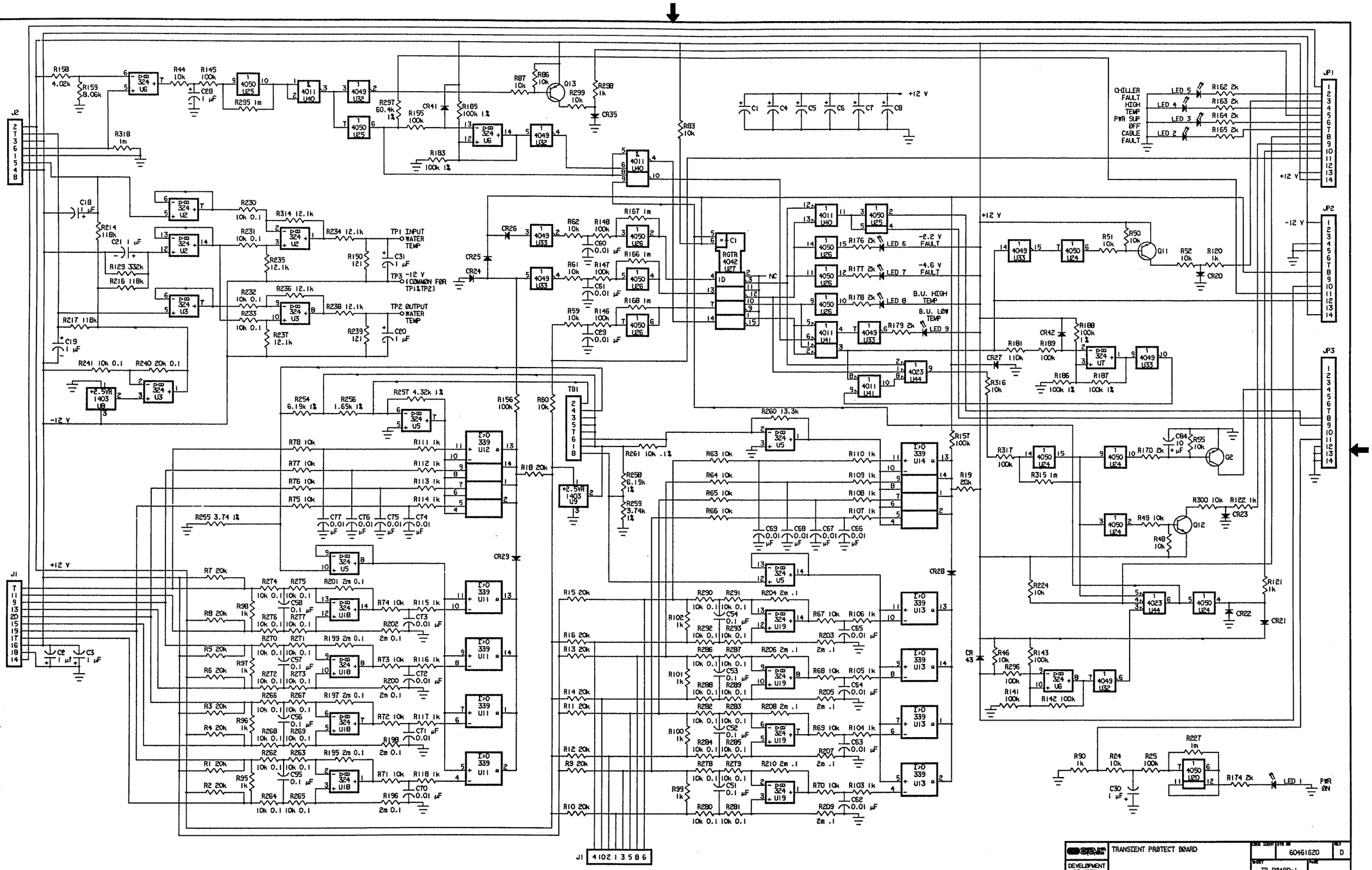
The latch at U27 latches data when the signal at pin 5 is low. Pin 5 is driven by pin 6 of the OR gate at U44. This gate activates (output low) when power-on reset, reset from the power control board, or one of the following occur:

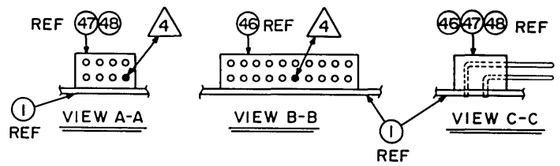
-4.7 V fault	Back-up high temperature
-2.2 V fault	Back-up low temperature

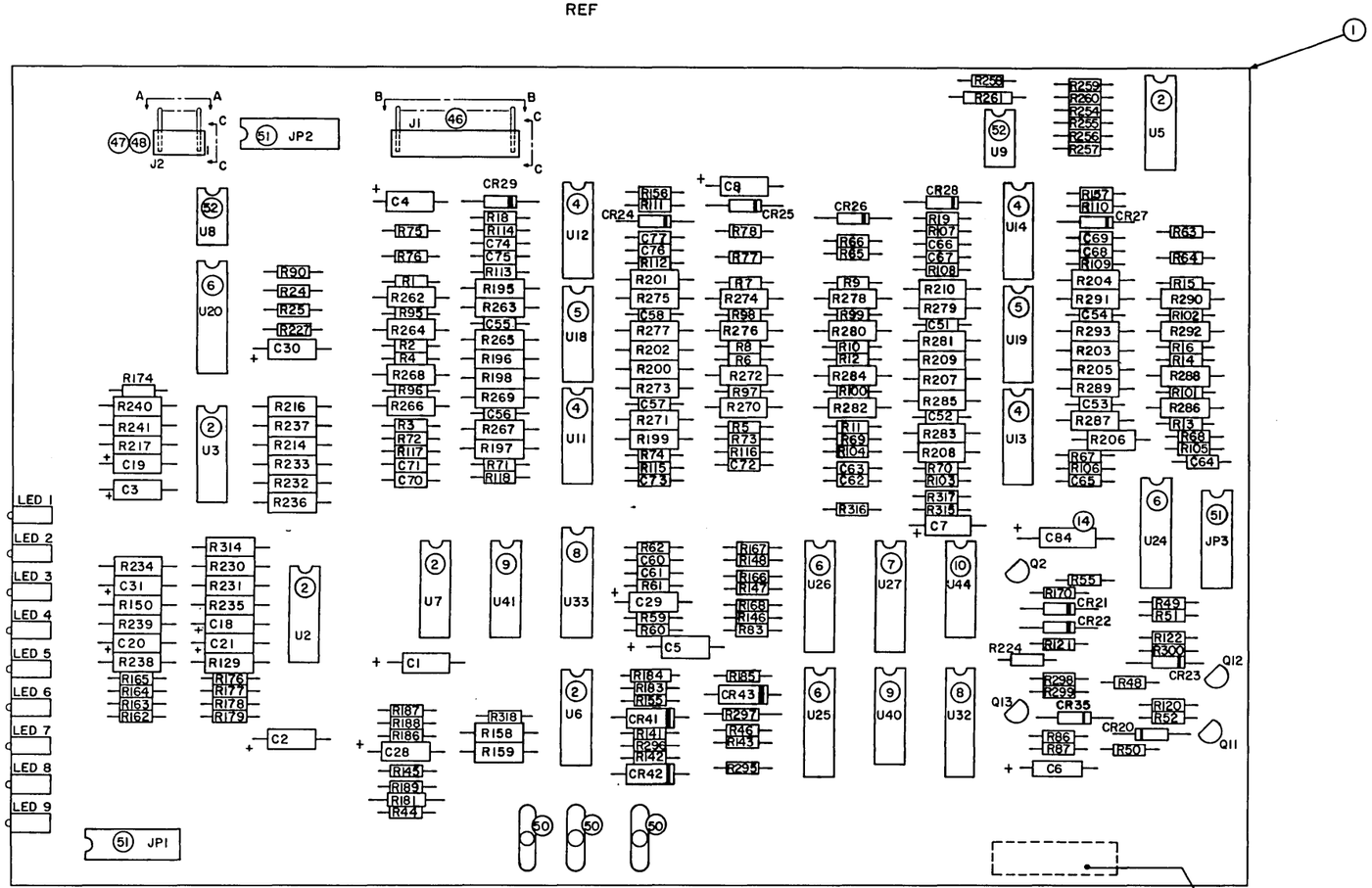
Thus, the data which drives the fault LEDs remains constant until the fault clears. The OR gate also generates back-up fault latch to the power-control board. The power-on reset generator (U6-8/9/10) functions similarly to the time delay circuits previously described.

Transient Test

The transient test signal from the power-control board (JP2-8) initiates a test of the -4.7 and -2.2 fault circuits (except the sensors) when the TEST switch is pressed. This function lights the 2.2 V FAULT and 4.7 V FAULT indicators and disables the -2.2 V and -4.7 V power supplies.


J2
JP1
JP2
JP3
J1
TP1 INPUT WATER TEMP
TP3 -12 V (COMMON FOR TP1&TP2)
TP2 OUTPUT WATER TEMP
CHILLER FAULT
HIGH TEMP
PWR SUP OFF
CABLE FAULT
LED 5
LED 4
LED 3
LED 2
-2.2 V FAULT
-4.6 V FAULT
B.U. HIGH TEMP
B.U. LOW TEMP
LED 6
LED 7
LED 8
LED 9
LED 1
PWR ON
+12 V
-12 V
TBI
RGTR 4042 U27
+2.5VR 1403 U8
+2.5VR 1403 U9
TRANSIENT PROTECT BOARD
DEVELOPMENT DIVISION
60461620
D
TP BOARD-1





NOTES:

1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
3. MARK ASSEMBLY NO. AND REV PER SPEC 10121502.
4. CLIP OFF PIN 12 OF J1, PIN 8 OF J2 FLUSH WITH CONNECTOR, MATING SIDE ONLY PRIOR TO MOUNTING.

F/N	REFERENCE DESIGNATION
11	C1-C8,C18-C21,C28-C31
12	C51-C58
13	C60-C77
15	R1-R16,R18,R19
16	R24,R44,R46,R48-R52,R55, R59-R78,R83,R86,R87, R224,R299,R300,R316
17	R90,R95-R118,R120-R122,R298
18	R25,R141-R143,R145-R148, R155-R157,R189,R296,R317
19	R162-R165,R170,R174,R176-R179
20	R214,R216,R217
24	R129
26	R230-R233,R241,R261-R293
27	R234-R238,R314
28	R150,R239
29	R240
32	R256
33	R257
36	R260
37	R166-R168,R227,R295,R315, R318
38	R183-R188
40	R195-R210
41	CR20-CR29,CR35
42	CR41-CR43
43	Q2
44	Q11,Q12,Q13
45	LED 1-9
53	R181
54	R158
55	R159
56	R297
57	R254,R258
58	R255,R259

CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	TRANSIENT PROTECT BOARD ASSEMBLY DIAGRAM (22697080)	CODE IDENT 34010	D	DWG NO 60461620 REV A
		TP BOARD-2	SHEET	

69

TEMPERATURE-PROTECT BOARD

The temperature-protect board safeguards each cabinet logic panel from high temperature conditions through primary and back-up fault detection. Refer to Temperature-Protect Board diagrams (TEMP PR-1 through TEMP PR-3). The four boards connect in series to the power-control board. A high temperature condition detected at any of five passes (points where coolant passes through a logic panel) lights a LED on the board cover panel to indicate that pass. The board also sends a fault signal to the power control board which may cause cabinet shutdown.

NOTE

Measure test points 1-5 to test point 6 (COM). Test point 6 is biased at -12 V dc. Do not use GND as a reference.

Test points 1 through 5 on the temperature-protect board cover panel allow voltmeter measurement of coolant temperature at each tubing pass.

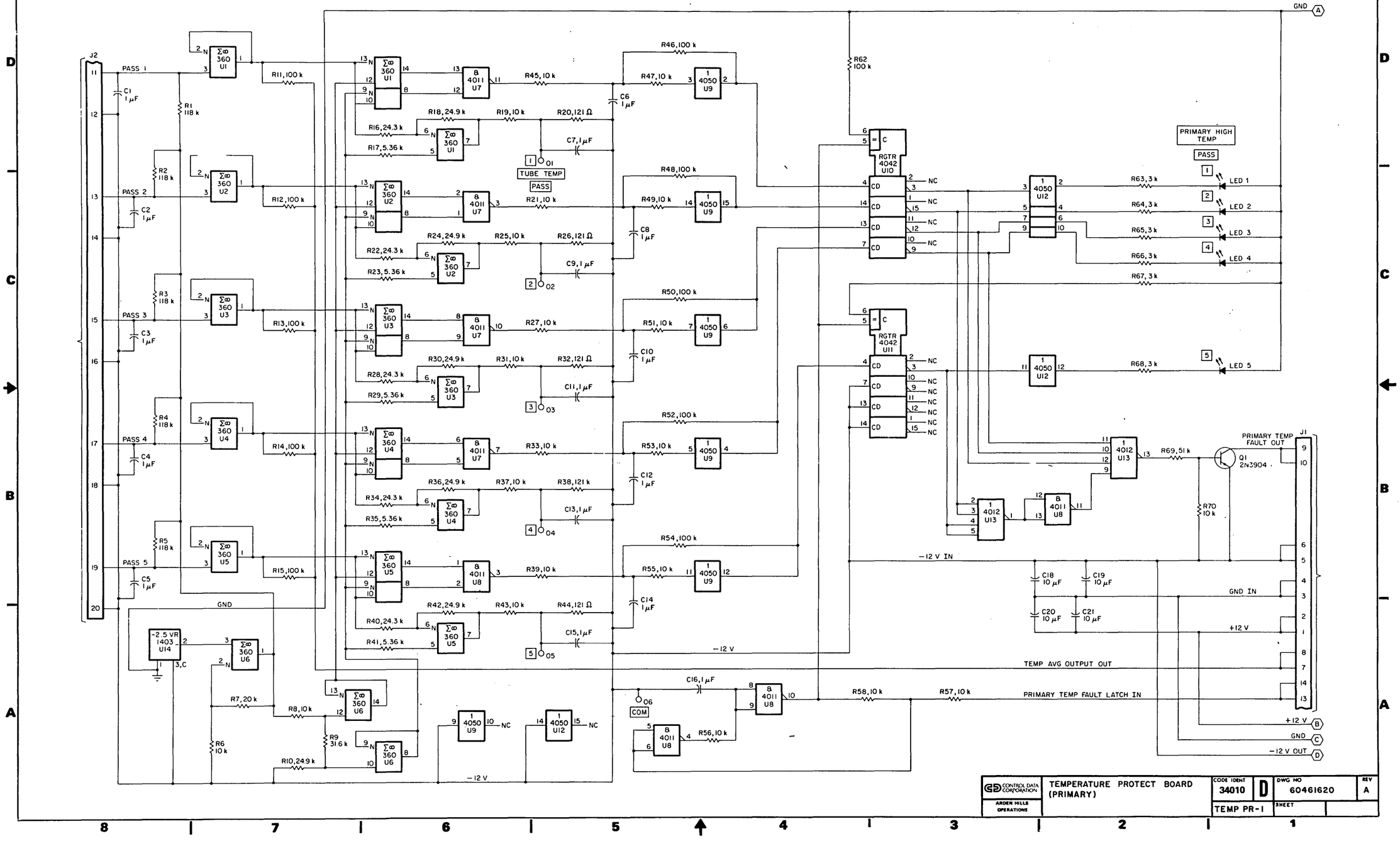
Two thermistors are mounted at each of the five coolant tubes (numbered 1-5 from top to bottom) where the coolant tubing passes through a logic panel. The thermistors supply a duplicate set of voltages to the temperature-protect board. One set is used in primary temperature fault detection (J2-11/13/15/17/19)†, and the other for back-up temperature fault detection (J2-1/3/5/7/9).† The thermistor voltages represent the coolant temperature at each pass. A primary fault condition occurs in an LSI column if any coolant pass temperature exceeds 35 °C (95 °F). A back-up fault occurs in an LSI column if the primary circuit fails and any coolant pass temperature exceeds 40 °C (104 °F). For ZIF columns, the primary limit is 38 °C (100 °F), and the back-up limit is 45 °C (113 °F).

In the primary circuit, each thermistor voltage entering J2-11/13/15/17/19 supplies a driver that sends the voltage to two comparators. Each comparator receives a reference input supplied by U6-14 or U6-8. Each reference compares to the thermistor voltage allowing two functions to be performed for each dual comparator set: 1) open thermistor check, and 2) primary overtemperature check. A fault condition in either case enables an OR gate and sets the appropriate flip flop in the U10/U11 register. The flip flop output lights the corresponding LED 1-5 on the board cover panel to indicate the coolant tubing pass where the fault occurred. The flip flop output also enables OR gate U13 and turns on Q1, sending primary high temperature fault to the power control board via J1-9/10. If the overtemperature condition is not temporary and cabinet shutdown occurs, the power control board returns primary fault latch to the appropriate temperature-protect board via J1-13/14. This latches the cover panel LED on.

†ZIF columns have only four coolant passes.

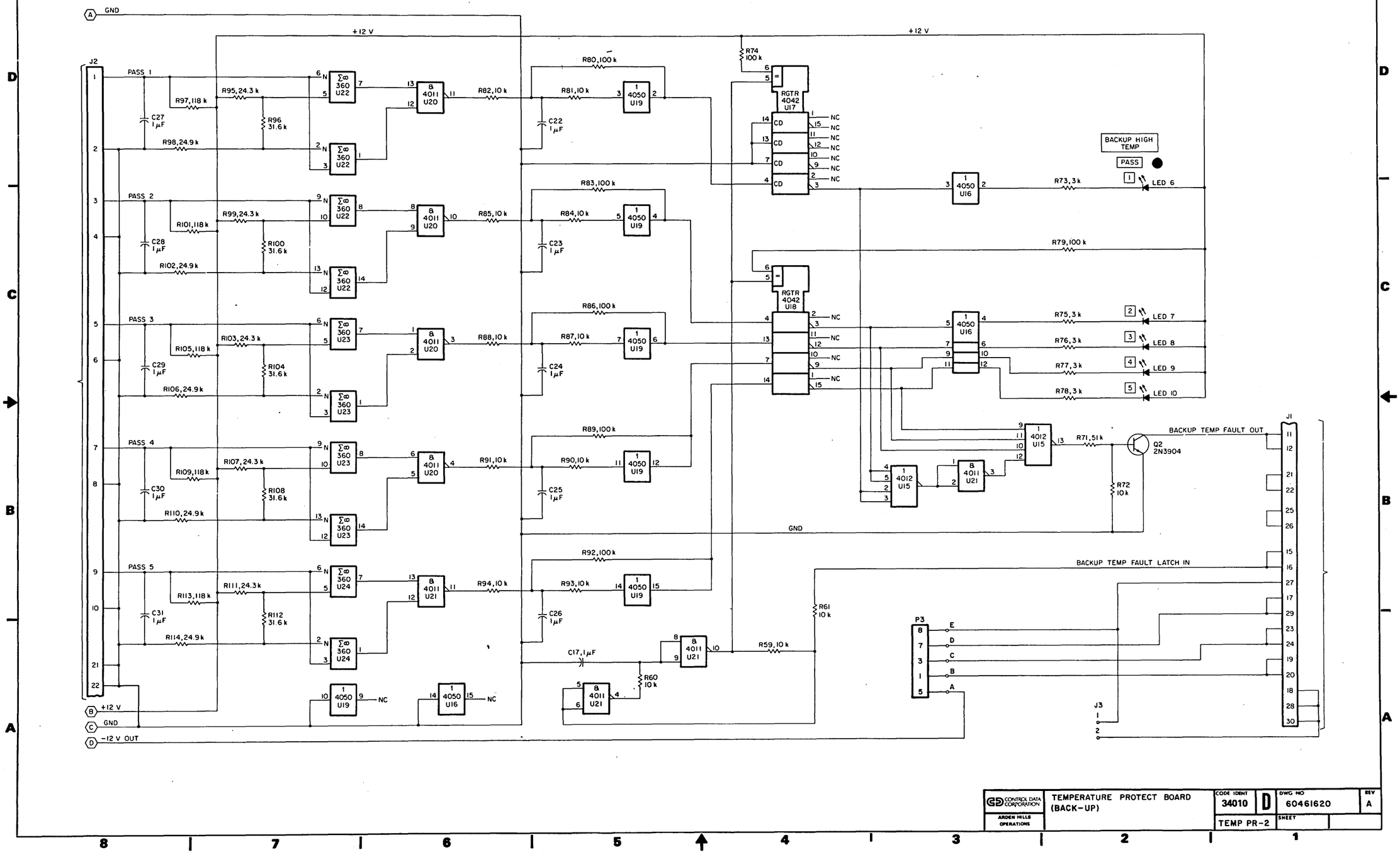
In the back-up circuit, each thermistor voltage entering J2-1/3/5/7/9 directly supplies two comparators. Each comparator receives one of two reference inputs supplied by voltage dividers at the comparator inputs. Each reference compares to a thermistor voltage allowing two functions to be performed for each dual comparator set: 1) open thermistor check, and 2) back-up temperature check. A fault condition in either case enables an OR gate and sets the appropriate flip flop in the U17/U18 register. The flip flop output lights the corresponding LED 6-10 on the board cover panel to indicate the tubing coolant pass where the fault occurred. The flip flop output also enabled OR gate U15 and turns on Q2 sending back-up high temperature fault to the power-control board via J1-11/12. If the overtemperature condition is not temporary and cabinet shutdown occurs, the power-control board returns back-up fault latch to the appropriate temperature-protect board via J1-15/16 thereby latching the cover panel LED on.

PRIMARY CIRCUIT

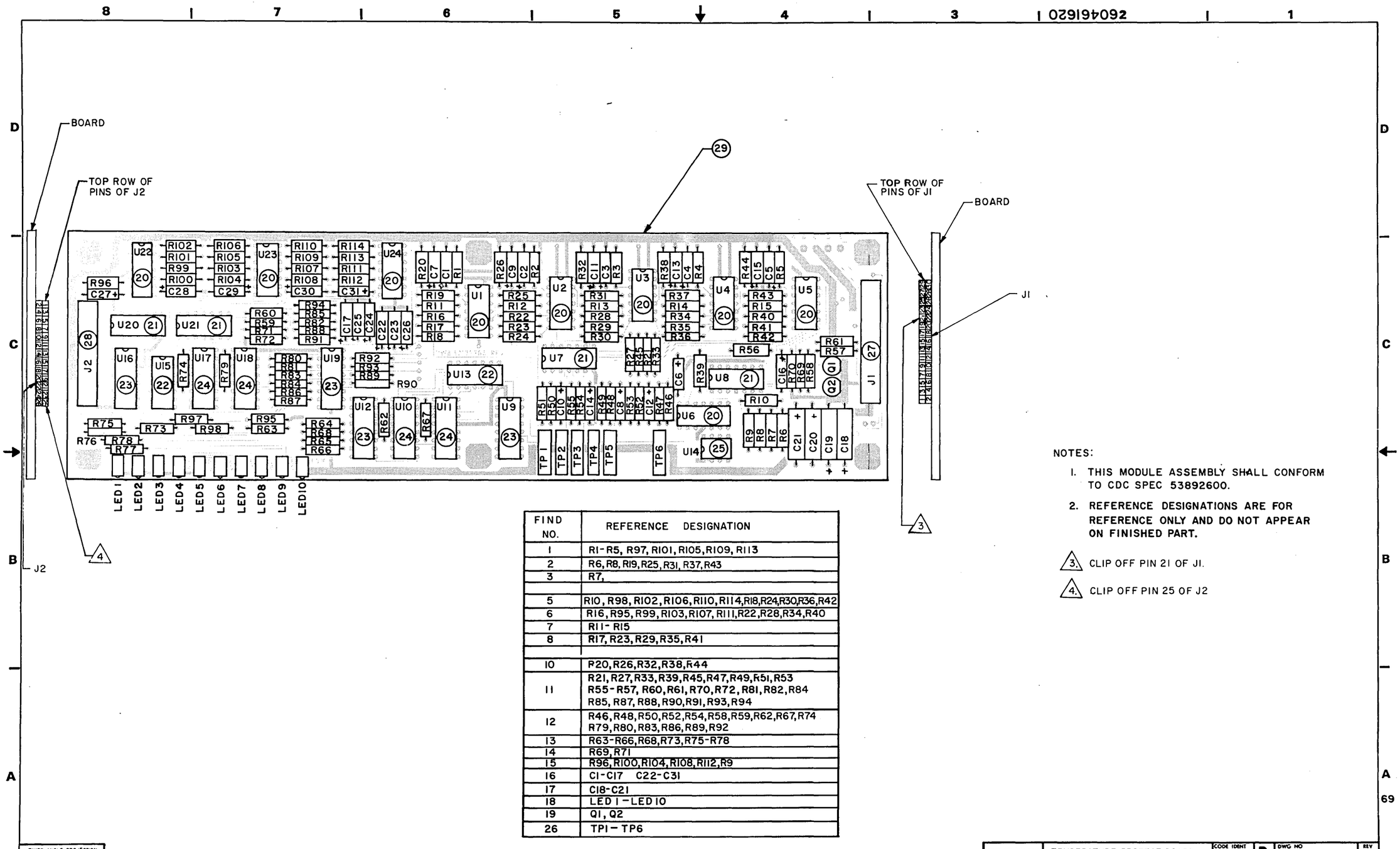


CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	TEMPERATURE PROTECT BOARD (PRIMARY)	CODE IDENT 34010	D	DWG NO 60461620 REV A
		TEMP PR-1	SHEET 1	

BACKUP CIRCUIT



CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	TEMPERATURE PROTECT BOARD (BACK-UP)	CODE IDENT 34010	D	DWG NO 60461620 REV A
		TEMP PR-2	SHEET 1	



FIND NO.	REFERENCE DESIGNATION
1	R1-R5, R97, R101, R105, R109, R113
2	R6, R8, R19, R25, R31, R37, R43
3	R7,
5	R10, R98, R102, R106, R110, R114, R18, R24, R30, R36, R42
6	R16, R95, R99, R103, R107, R111, R22, R28, R34, R40
7	R11-R15
8	R17, R23, R29, R35, R41
10	R20, R26, R32, R38, R44
11	R21, R27, R33, R39, R45, R47, R49, R51, R53 R55-R57, R60, R61, R70, R72, R81, R82, R84 R85, R87, R88, R90, R91, R93, R94
12	R46, R48, R50, R52, R54, R58, R59, R62, R67, R74 R79, R80, R83, R86, R89, R92
13	R63-R66, R68, R73, R75-R78
14	R69, R71
15	R96, R100, R104, R108, R112, R9
16	C1-C17 C22-C31
17	C18-C21
18	LED1-LED10
19	Q1, Q2
26	TP1-TP6

NOTES:

1. THIS MODULE ASSEMBLY SHALL CONFORM TO CDC SPEC 53892600.
2. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.

3. CLIP OFF PIN 21 OF JI.

4. CLIP OFF PIN 25 OF J2

THIRD ANGLE PROJECTION

CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS

TEMPERATURE PROTECT BOARD ASSEMBLY DIAGRAM (53139785)

CODE IDENT 34010 | D | DWG NO 60461620 | REV A

TEMP PR-3 | SHEET

69

-2.2 V REGULATOR

The -2.2 V regulator provides regulated -2.2 V logic power. It consists of a shunt regulator circuit and a fault circuit. An 80 amp and a 160 amp version of this board are used. Refer to the -2.2 V Regulator diagrams (2.2-V REG-1 through 2.2-V REG-3).

Shunt Regulator Circuit

The amplifier at U41, shunt transistors Q1 through Q9, Q13, and Q15 and associated components form the shunt regulator circuit for the 80-amp version. The 160-amp version also has shunt transistors Q16 through Q25.

The amplifier is referenced to a voltage divider across -2.7 V and to -2.2 V. If -2.2 V decreases because of an increase in current through the series resistance (R60 through R62 and R66 through R68), the amplifier drives the bases of Q9 and Q11 toward ground. This decreases current in the shunt transistors and -2.2 V increases. Thus the -2.2 output voltage tends to remain constant, and the -2.7 output current tends to remain constant. Maximum output current is determined by the series resistance. Straps allow connection of the required number of resistors to adjust current for the related logic panel.

Fault Circuit

The fault circuit detects voltage and current fault conditions. When a fault condition occurs, a LED indicates the fault and a fault signal goes to the power control board.

Fault Detect

The fault circuit detects overvoltage, undercurrent, and overcurrent.

Overvoltage: The comparator at U2-1/6/7 detects overvoltage. If -2.2 V increases more than 15% of nominal, the comparator switches and the latch at U4-1/2/3/4/5/6 sets.

Undercurrent: The comparator at U2-10/11/13 detects undercurrent. It monitors the voltage drop across the series resistor. If current through the resistor decreases by more than 15% of nominal, the comparator switches and the related latch sets.

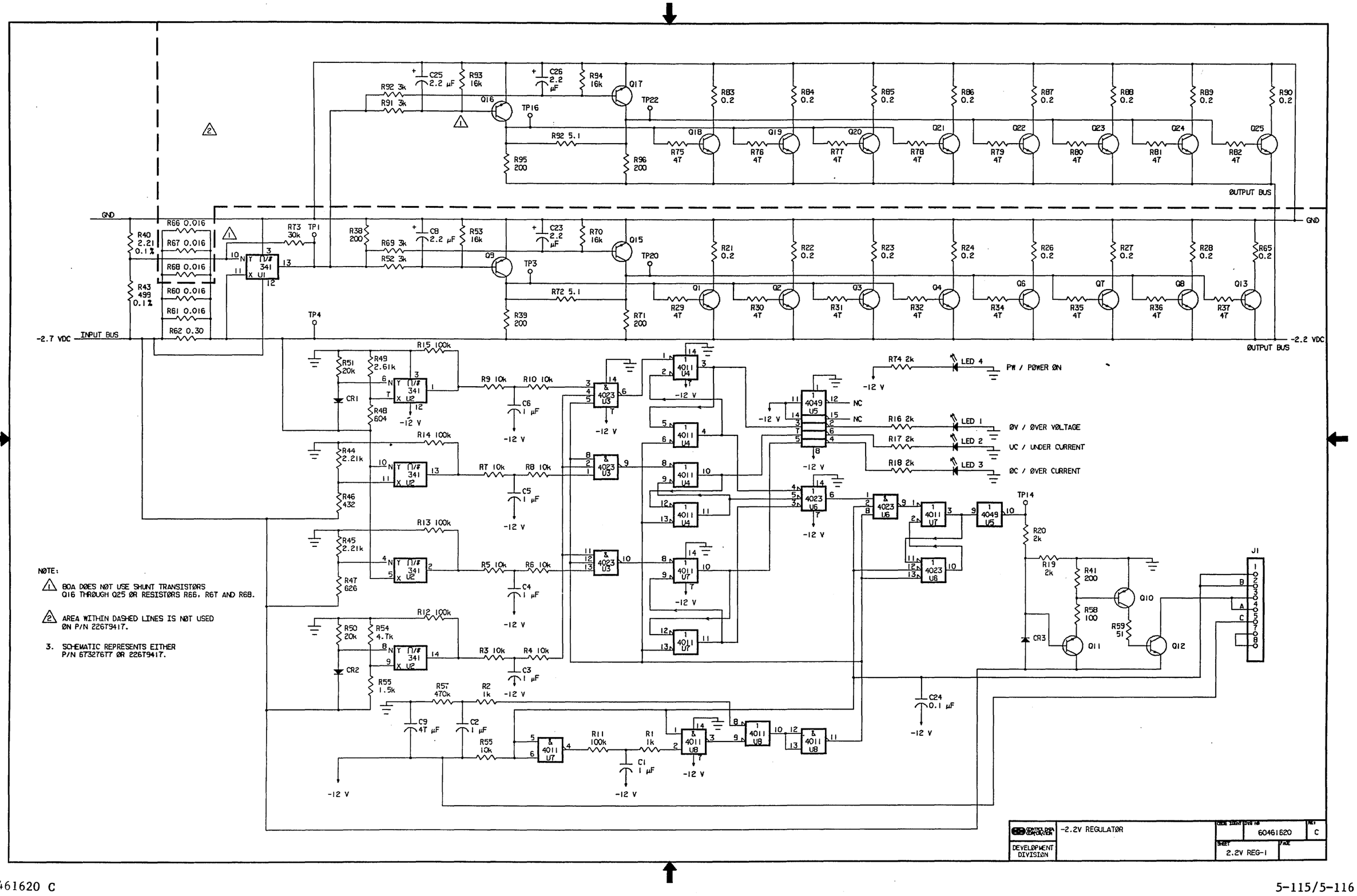
Overcurrent: The comparator at U2-2/4/5 detects overcurrent by monitoring the voltage drop across the series resistor. If current through the resistor increases by more than 15% of nominal, the comparator switches and the related latch sets.

Fault Signal

The overvoltage, undercurrent, and overvoltage latch outputs are ORed at U6-3/4/5/6. When a fault occurs, the AND gate at U6-1/2/8/9 is enabled. This results in a low -2.2 V disable signal at J3-3/4. 2.7 AC disable on the power-control board then activates.

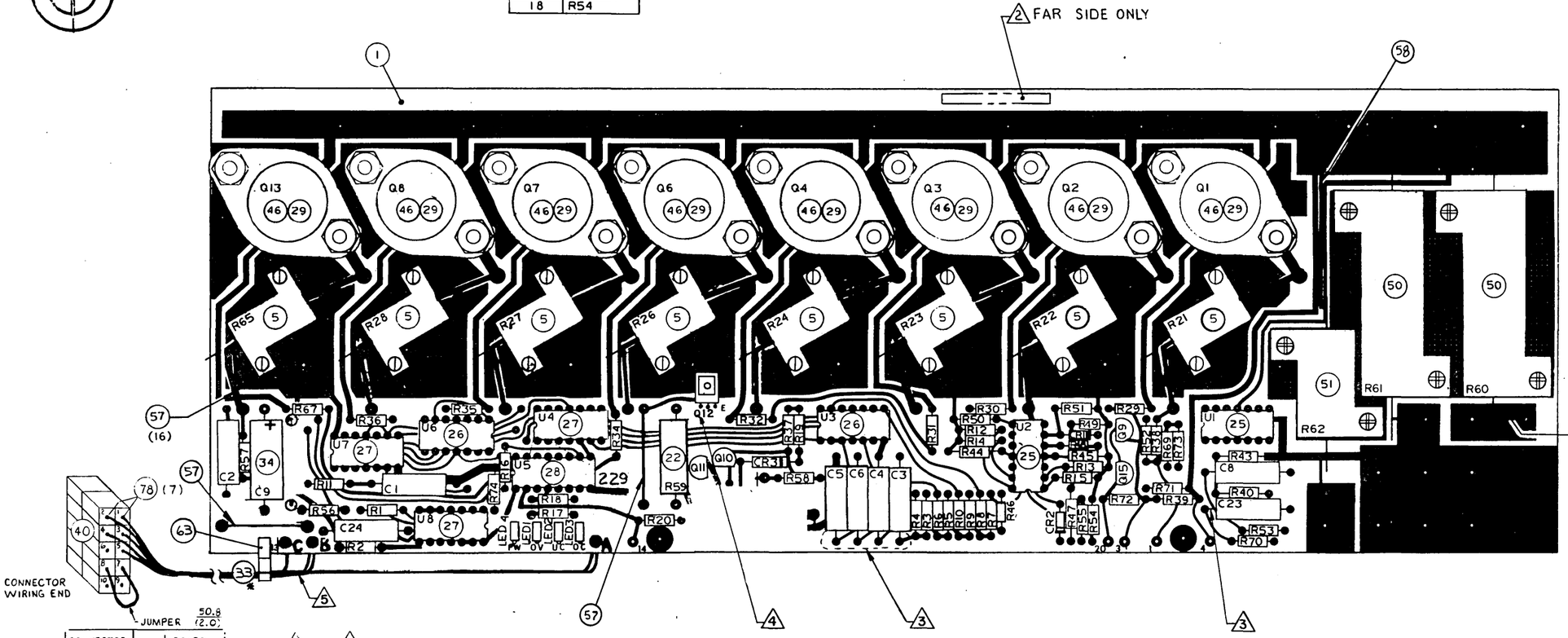
J6-1 connects to a contact on the col on relay (K4) on the power-control board. When a reset occurs, this contact grounds through J6-1. The pulse generator at the lower left of the diagram then activates. A low pulse appears at U8-11 which clears the latches. The ground through the col on relay contacts also holds U6-2 high during normal operation.

The comparator at U2-8/9/14 disables the U3 AND gates until -2.7 V is fully on. The pulse generator circuit disables the U3 AND gates and U6-8/13 until -12 V is fully on.


GND
-2.7 VDC
INPUT BUS
-2.2 VDC
ØUTPUT BUS
GND
ØUTPUT BUS
R66 0.016
R67 0.016
R68 0.016
R60 0.016
R61 0.016
R62 0.30
R40 2.21 0.1%
R43 499 0.1%
R73 30k
TP1
TP4
TP3
TP16
TP20
TP22
TP14
R92 3k
R91 3k
R93 16k
R94 16k
C25 2.2 µF
C26 2.2 µF
Q16
Q17
R92 5.1
R95 200
R96 200
R83 0.2
R84 0.2
R85 0.2
R86 0.2
R87 0.2
R88 0.2
R89 0.2
R90 0.2
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
R75 4T
R76 4T
R77 4T
R78 4T
R79 4T
R80 4T
R81 4T
R82 4T
R38 200
R69 3k
R52 3k
R53 16k
C8 2.2 µF
C23 2.2 µF
R70 16k
Q9
Q15
R72 5.1
R39 200
R71 200
R21 0.2
R22 0.2
R23 0.2
R24 0.2
R26 0.2
R27 0.2
R28 0.2
R65 0.2
Q1
Q2
Q3
Q4
Q6
Q7
Q8
Q13
R29 4T
R30 4T
R31 4T
R32 4T
R34 4T
R35 4T
R36 4T
R37 4T
R15 100k
R14 100k
R13 100k
R12 100k
R51 20k
R49 2.61k
R48 604
R44 2.21k
R46 432
R45 2.21k
R47 626
R50 20k
R54 4.7k
R55 1.5k
CR1
CR2
R9 10k
R10 10k
C6 1 µF
R7 10k
R8 10k
C5 1 µF
R5 10k
R6 10k
C4 1 µF
R3 10k
R4 10k
C3 1 µF
R57 470k
R2 1k
C9 47 µF
C2 1 µF
R55 10k
R11 100k
R1 1k
C1 1 µF
-12 V
R74 2k
LED 4
PW / PØWER ØN
R16 2k
LED 1
ØV / ØVER VØLTAGE
R17 2k
LED 2
UC / UNDER CURRENT
R18 2k
LED 3
ØC / ØVER CURRENT
NC
R20 2k
R19 2k
R41 200
R58 100
R59 51
Q10
Q11
Q12
CR3
C24 0.1 µF
J1
A
B
C
NØTE:
1. ØA DØES NØT USE SHUNT TRANSISTØRS Q16 THRØUGH Q25 ØR RESISTØRS R66, R67 AND R68.
2. AREA WITHIN DASHED LINES IS NØT USED ØN P/N 226T9417.
3. SCHEMATIC REPRESENTS EITHER P/N 6732767T ØR 226T9417.
-2.2V REGULATØR
DEVELØPMENT DIVISION
60461620
C
2.2V REG-1

FIND NO	REF. DESIG.
2	R1, R2
3	R11 - R15
4	R16-R20,R74
6	R29-R32, R34-R36,R67
7	R37-R39,R71
8	R40
9	R47
10	R43
11	R44,R45
12	R46
13	R48
14	R49
15	R50,R51
16	R3-R10,R56
17	R53,R70
18	R54

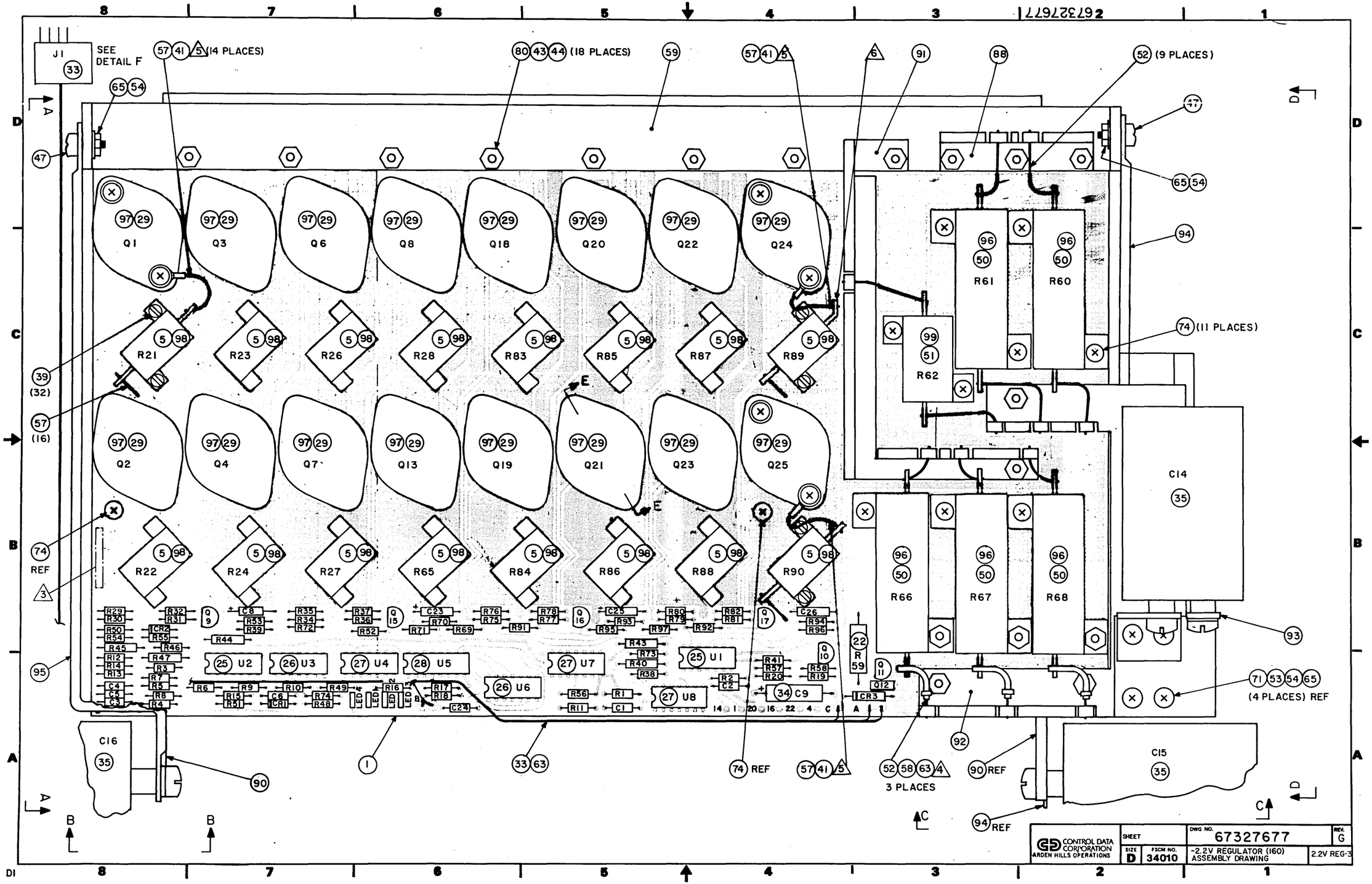
FIND NO	REF. DESIG.
19	R55
20	R57
21	R58
22	R59
23	R52,R69
24	C8,C23,C24, C1-C6
30	Q9-Q11,Q15
32	Q12
36	CR1-CR2
37	CR3
38	LED1-LED4
64	R73
62	R72



CONNECTOR PINS		BOARD POSITION
1 AND 2	TO	B
3 AND 4	TO	A
5	TO	C
7 TO 8		

* SEE 1 AND 5 SHEET 1.

GD ARDEN HILLS OPERATIONS	-2.2V REGULATOR (80) ASSEMBLY DRAWING	CODE IDENT 34010 / D	DWG NO 22679417 / REV C
		2.2V REG-2	SHEET

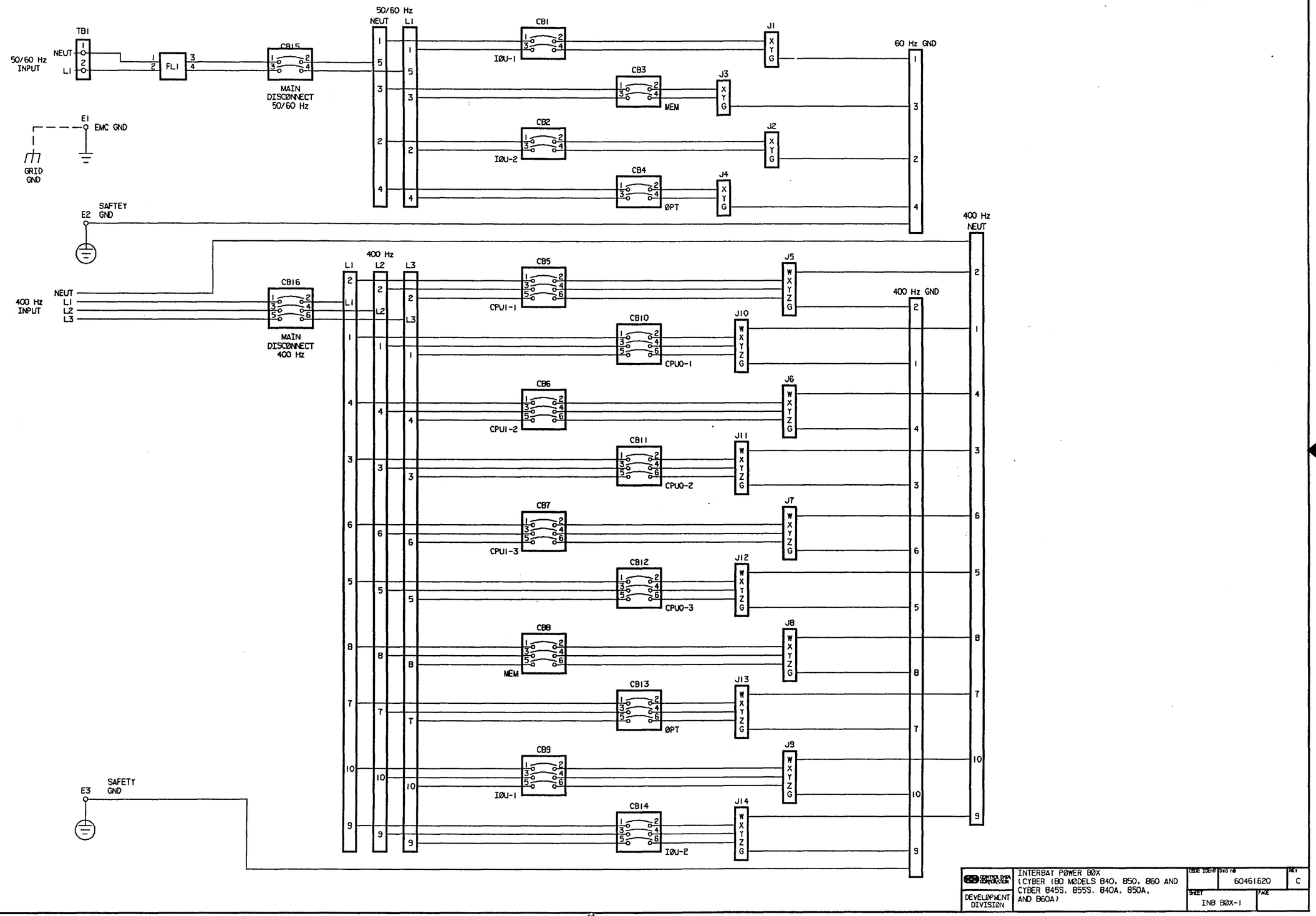

SEE DETAIL F
J1
33
57 41 5 (14 PLACES)
80 43 44 (18 PLACES)
59
57 41 5
6
91
88
52 (9 PLACES)
47
65 54
94
74 (11 PLACES)
39 (32)
57 (16)
74 REF
95
93
71 53 54 65 (4 PLACES) REF
92
90
1
33 63
74 REF
57 41 5
52 58 63 4 3 PLACES
90 REF
94 REF
Q1 Q3 Q6 Q8 Q18 Q20 Q22 Q24
Q2 Q4 Q7 Q13 Q19 Q21 Q23 Q25
R21 R23 R26 R28 R83 R85 R87 R89
R22 R24 R27 R65 R84 R86 R88 R90
R61 R60 R62 R66 R67 R68
C14 C15 C16
U1 U2 U3 U4 U5 U6 U7 U8
C9
CR3
R59
CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS
SHEET
SIZE D
FSCM NO. 34010
DWG NO. 67327677
REV. G
-2.2V REGULATOR (160) ASSEMBLY DRAWING
2.2V REG-3

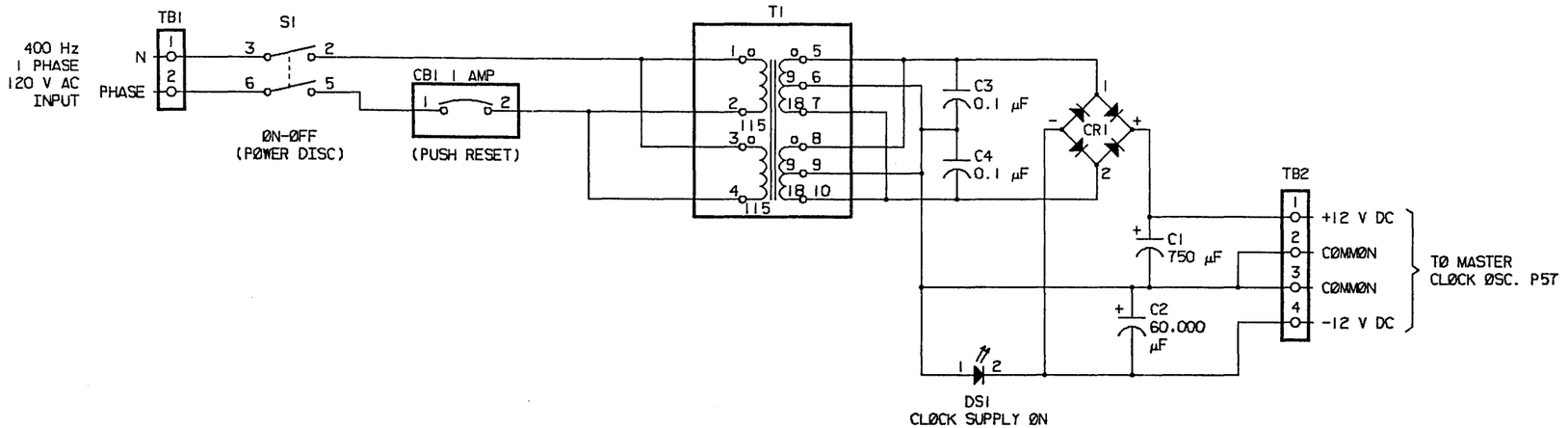
INTERBAY POWER BOX (CYBER 180 MODELS 840, 850, 860 AND CYBER 845S, 855S, 840A, 850A, 860A)

The interbay power box provides overcurrent protection and distributes 50/60-Hz and 400-Hz power to models 840, 850, 860 and CYBER 845S, 855S, 840A, 850A, 860A system equipment. Refer to Interbay Power Box diagram (INB BOX-1). Main breakers disconnect the input 50/60-Hz and 400-Hz while other breakers disconnect system equipment circuit breaker, frequency, connector, and equipment relationship is as follows:

Circuit Breaker	Frequency	Connector	Equipment
CB 1	50/60-Hz	J1	IOU-1
CB 2	50/60-Hz	J2	IOU-2
CB 3	50/60-Hz	J3	Memory
CB 4	50/60-Hz	J4	Option
CB 5	400-Hz	J5	CPU-1
CB 6	400-Hz	J6	CPU-2
CB 7	400-Hz	J7	CPU-3
CB 8	400-Hz	J8	Memory
CB 9	400-Hz	J9	IOU-1
CB10	400-Hz	J10	CPU0-1
CB11	400-Hz	J11	CPU0-2
CB12	400-Hz	J12	CPU0-3
CB13	400-Hz	J13	Option
CB14	400-Hz	J14	IOU-2

CB15 is the main 50/60-Hz circuit breaker and CB16 is the main 400-Hz circuit breaker.


TB1
50/60 Hz INPUT
NEUT
L1
FL1
CB15
MAIN DISCONNECT 50/60 Hz
50/60 Hz
NEUT
L1
E1
EMC GND
GRID GND
SAFTEY GND
E2
CB1
IØU-1
CB3
MEM
CB2
IØU-2
CB4
ØPT
J1
J2
J3
J4
60 Hz GND
400 Hz NEUT
400 Hz INPUT
NEUT
L1
L2
L3
CB16
MAIN DISCONNECT 400 Hz
400 Hz
CB5
CPUI-1
CB10
CPUO-1
CB6
CPUI-2
CB11
CPUO-2
CB7
CPUI-3
CB12
CPUO-3
CB8
MEM
CB13
ØPT
CB9
IØU-1
CB14
IØU-2
J5
J10
J6
J11
J7
J12
J8
J13
J9
J14
400 Hz GND
E3
SAFETY GND
INTERBAY PØWER BØX
(CYBER 180 MØDELS 840, 850, 860 AND CYBER 845S, 855S, 840A, 850A, AND 860A)
CONTROL DATA CORPORATION
DEVELØPMENT DIVISION
60461620
C
INB BØX-1



CONTROL DATA	INTERBAY CLØCK PØWER SUPPLY	CODE IDENT	DWG NØ 60461620	REV D
DEVELOPMENT DIVISION	CYBER 180 MØDELS 990, 990E, AND 995E	C	SHEET INB BØX-2	PAGE

GH251-A WATER COOLING UNIT FAULT WARNING AND SHUTDOWN

The GH251-A requires one of two interface assemblies. The early interface assembly allows the GH251-A to operate with a TMPC wall box. A later interface assembly provides the capability to operate with a TMPC, SPCP, SPM wall box, or without a wall box. The following text describes GH251-A operation with an early interface assembly. A following subsection describes the later interface assembly. Refer to related GH251-A power diagrams (GH251-1 through GH251-3).

GH251-A Early Interface Assembly

The SPM sends Chiller Solenoid (remote start) to the cooling unit cabinet via the cooling unit cabinet interface assembly. Remote Start (120-V) passes through the mode control switch which enables the step-down transformer to reduce 120-V to 24-V. The 24-V is used to start the modulating motor and activate the fault detection circuit.

NOTE

24-V is supplied to all fault detection devices except the Low Pressure Switch which uses 120-V.

If no faults are detected, the pump motor relay energizes, passing 230-V through to start the pump motor.

Cooling unit faults arise from high pump motor current, high/low water level, and high/low water pressure.

GH251-A High Pump Motor Current

High pump motor current causes the following to occur:

- Pump motor relay overload heaters activate, causing heater contacts to open and deenergize pump motor relay, removing power from water pump motor.
- Fault detection circuit senses pump motor fault and sends a fault signal to cabinet interface assembly.
- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault to SPM.

GH251-A High/Low Water Level Fault

High/low water level fault causes the following to occur:

- Water level sensor assembly senses the fault condition and sends appropriate (high or low water) fault signal to fault detection circuit.
- Fault detection circuit lights appropriate fault indicator, sends fault signal to interface assembly, and deenergizes pump motor relay which removes power from the pump motor.
- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault to SPM.

GH251-A High/Low Water Pressure Fault

High water pressure fault causes the following to occur:

- Water pressure control assembly senses the fault condition and sends high water pressure fault signal to fault detection circuit.
- Fault detection circuit lights appropriate fault indicator, deenergizes pump motor relay which removes power from the pump motor, and sends fault signal to interface assembly.
- Interface assembly senses fault signal, deenergizes interface fault control relay low water pressure fault, and sends Chiller Fault to SPM.

Low water pressure fault causes the following to occur:

- Water pressure control assembly senses the low water pressure fault condition and sends fault signal to the interface assembly.
- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault to SPM.

GH251-A Later Interface Assembly

The later interface assembly provides the signals required for GH251-A water cooling unit to function with the SPCP, TMPC, or SPM wall boxes or with a stand-alone unit (not under control of a wall box).

Interface assembly TB1 connects to an SPCP or TMPC wall box. The signals are:

TB-1	Chiller Solenoid	TB1-5	Chiller Fault
TB-2	Chiller Solenoid	TB1-6	Chiller Fault
TB-3,4	Not used	TB1-7-12	Not used

This interface functions the same as the interface assembly described under GH251-A Water Cooling Unit in preceding text.

J1 connects to an SPM wall box. The signals are:

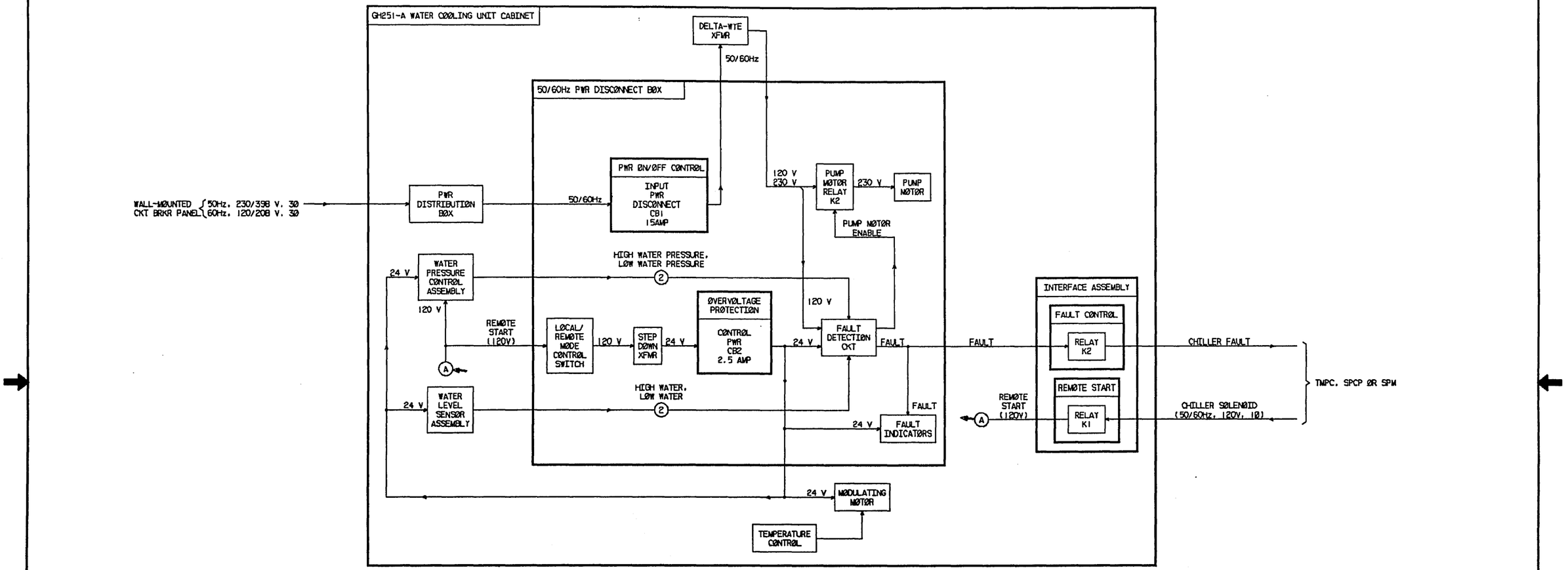
J1-1,2	Not Used	J1-5	Chiller Warning
J1-3	Chiller On	J1-6	Water Temp
J1-4	Chiller Run	J1-7,9	Ground

A Chiller Run signal from the SPM energizes K3. If its LOCAL/REMOTE switch is on REMOTE, the GH251-A receives 120-V ac for remote starting via K3-9/10. A successful start energizes K2 and Chiller On is activated via K3-6/7 and K2-15/16. Chiller Warning to the SPM is always at ground. The operational amplifier at U1-1/2/3 receives the water temperature sense signal and generates water temperature which goes to the SPM. A water cooling unit fault deenergizes K2 and opens contacts 15 and 16. Chiller on to the SPM then deactivates.

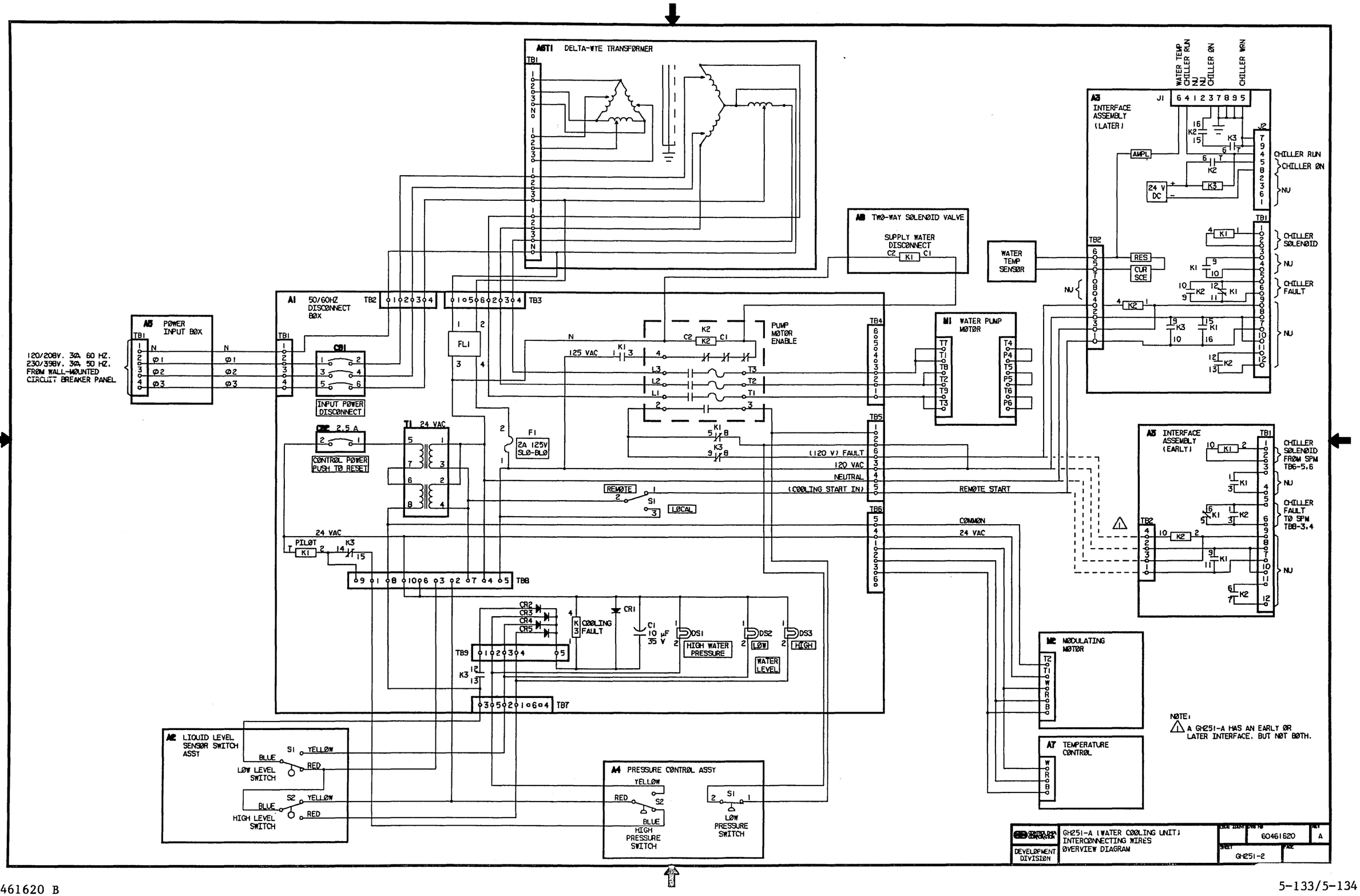
J2 connects to an equipment unit operating stand-alone (not controlled by a wall box). The signals are:

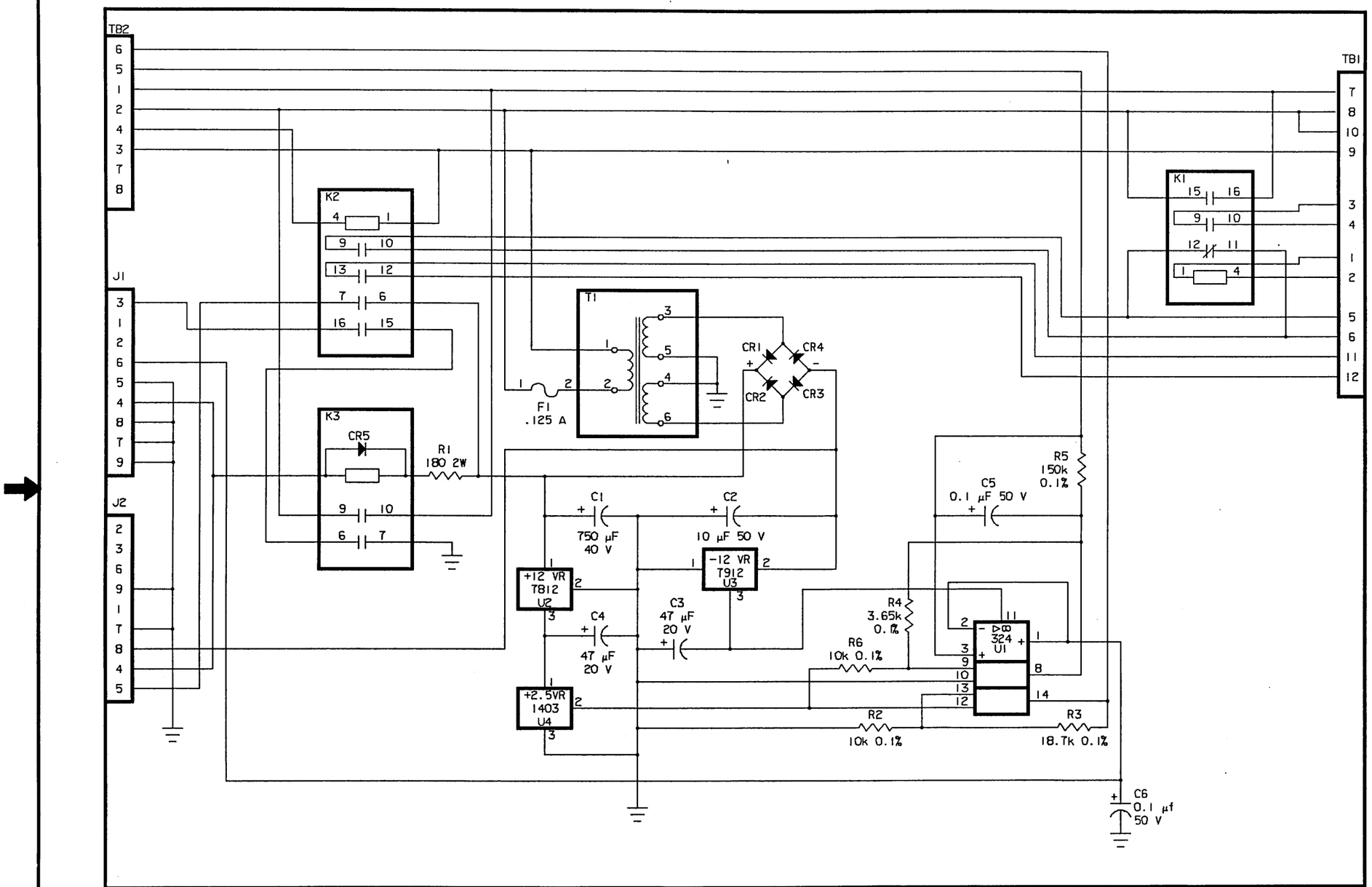
J2-1,2,3	Not used	J2-6	Not used
J2-4	Remote On	J2-7,9	Ground
J2-5	Chiller On	J2-8	Chiller On

Remote On from the stand-alone unit energizes K3. If its LOCAL/REMOTE switch is on REMOTE, the GH251-A receives 120 V ac for starting via K3-9/10. A successful start energizes K2 and Chiller On to the stand-alone unit is activated via K2-6/7. A water cooling unit fault deenergizes K2 causing contacts 6 and 7 to open. Chiller On to the stand-alone unit then deactivates.



DEVELOPMENT DIVISION	GH251-A (WATER CØØLING UNIT) PØWER DISTRIBUTIØN AND WARNING SYSTEM BLØCK DIAGRAM	CODE IDENT / DWG NO: 60461620	REV: D
		SHEET: GH251-1	PAGE:


A5T1 DELTA-WYE TRANSFØRMER
TB1
A3 INTERFACE ASSEMBLY (LATER)
J1
6 4 1 2 3 7 8 9 5
WATER TEMP
CHILLER RUN
CHILLER ØN
CHILLER WRN
J2
AMPL
24 V DC
CHILLER RUN
CHILLER ØN
NU
A8 TWØ-WAY SØLENØID VALVE
SUPPLY WATER DISCØNNECT
C2 K1 C1
WATER TEMP SENSØR
TB2
RES
CUR SCE
CHILLER SØLENØID
CHILLER FAULT
A1 50/60HZ DISCØNNECT BØX
TB3
A5 PØWER INPUT BØX
120/208V. 3Ø. 60 HZ.
230/398V. 3Ø. 50 HZ.
FRØM WALL-MØUNTED
CIRCUIT BREAKER PANEL
CB1
INPUT PØWER DISCØNNECT
PUMP MØTØR ENABLE
M1 WATER PUMP MØTØR
TB4
TB5
TB6
CB2 2.5 A
CØNTRØL PØWER PUSH TØ RESET
T1 24 VAC
F1 2A 125V SLØ-BLØ
FL1
125 VAC
(120 V) FAULT
120 VAC
NEUTRAL
(CØØLING START IN)
REMØTE START
REMØTE
LØCAL
S1
COMMON
24 VAC
PILØT
TB8
CR1
CR2
CR3
CR4
CR5
C1 10 µF 35 V
CØØLING FAULT
DS1 HIGH WATER PRESSURE
DS2 LØW WATER LEVEL
DS3 HIGH
TB9
TB7
M2 MØDULATING MØTØR
A7 TEMPERATURE CØNTRØL
A5 INTERFACE ASSEMBLY (EARLY)
CHILLER SØLENØID FRØM SPM TB6-5,6
CHILLER FAULT TØ SPM TB8-3,4
NØTE:
⚠ A GH251-A HAS AN EARLY ØR LATER INTERFACE, BUT NØT BØTH.
A2 LIQUID LEVEL SENSØR SWITCH ASSY
LØW LEVEL SWITCH
HIGH LEVEL SWITCH
A4 PRESSURE CØNTRØL ASSY
HIGH PRESSURE SWITCH
LØW PRESSURE SWITCH
GH251-A (WATER CØØLING UNIT) INTERCØNNECTING WIRES ØVERVIEW DIAGRAM
DEVELØPMENT DIVISION
60461620
A
GH251-2



CONTROL DATA CORPORATION	GH251-A/B. INTERFACE ASSY 5-TØN CHILLER	CODE IDENT	DRG NØ 60461620 REV A
DEVELØPMENT DIVISIØN		C	SHEET GH251 A/B PAGE

GH251-C WATER COOLING UNIT FAULT WARNING AND SHUTDOWN

The GH251-C interface assembly allows the GH251-C to operate with either an SPCP or SPM wall box, or no wall box at all. Refer to the related GH251-C power diagrams (GH251-C1 through GH251-C3).

GH251-C Interface Assembly

The interface assembly provides the signals required for a GH251-C water cooling unit to function with the SPCP or the SPM wall boxes or with a stand-alone unit (not under control of a wall box).

Interface assembly TB1 connects to an equipment unit operating as a stand-alone (not controlled by a wall box). The signals are:

TB1-1	Chiller Solenoid	TB1-5	Chiller Fault
TB1-2	Chiller Solenoid	TB1-6	Chiller Fault
TB1-3, -4	Not used	TB1-7, -12	BS194/195 only

Chiller Solenoid (remote start) is routed to the water cooling unit cabinet via K1-15/16 and K4-12/13 of the interface assembly. Remote Start (120-V) passes through the mode control switch which enables the step-down transformer to reduce 120-V to 24-V. The 24-V is used to start the modulating motor and activate the fault detection circuit. If no faults are detected, the pump motor relay K1 energizes, passing 3-phase 208-V or 398-V through to start the pump motor.

Connector J1 connects to an SPM wall box. The signals are:

J1-1, -2	Not used	J1-5	Chiller Warning
J1-3	Chiller On	J1-6	Water Temp
J1-4	Chiller Run	J1-7, -8, -9	Ground

A Chiller Run signal from the SPM energizes K3. If its LOCAL/REMOTE switch is set to REMOTE, The GH251-C receives 120-V ac for remote starting via K3-9/10 and K4-12/13. Relay A1K1-3/4 closes and energizes K2. Chiller On is activated via K3-6/7 and K2-15/16. Chiller Warning (J1-5) to the SPM is always at ground. The operational amplifier at U1-1/2/3 receives the water temperature sense signal and generates Water Temperature which goes to the SPM via J1-8. A water cooling unit fault deenergizes K2 and opens contacts 15 and 16. Chiller On to the SPM then deactivates.

Connector J2 connects to an SPCP wall box. The signals are as follows:

J2-1, -2, -3	Not used	J2-6	Not used
J2-4	Chiller Run	J2-7, -9	Ground
J2-5	Chiller On	J2-8	Chiller On

Remote On from the SPCP energizes K3. If its LOCAL/REMOTE switch is set to REMOTE, the GH251-C receives 120-V for starting via K3-9/10 and K4-12/13. Relay A1K1-3/4 closes and energizes K2, and Chiller On to the SPCP is activated via K2-6/7. A water cooling fault deenergizes K2 causing contacts 6 and 7 to open. Chiller On to the SPCP wall box then deactivates.

Cooling unit faults arise from high pump motor current, high/low water level, high/low water pressure, and low room temperature (condensation on dew point sensor).

Chiller Chassis water temperature is also sensed, by thermistor, in the chiller and a signal is sent from U1-1 to the SPM for readout.

GH251-C High Pump Motor Current

High pump motor current causes the following to occur:

- Pump motor relay overload heaters activate, causing heater contacts to open and deenergize pump motor relay, removing power from water pump motor.
- Dropping of pump motor relay deenergizes interface assembly fault control relay, and sends Chiller Fault.

GH251-C High/Low Water Level Fault

High/low water level fault causes the following to occur:

- Liquid level sensor assembly senses the fault condition and sends appropriate (high or low water) fault signal to fault detection circuit on interface assembly.
- Fault detection circuit lights appropriate fault indicator immediately, and deenergizes pump motor relay which removes power from the pump motor when the fault condition has existed for 8 seconds.
- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault.

GH251-C High/Low Water Pressure Fault

High water pressure fault causes the following to occur:

- Pressure control assembly senses the fault condition and sends high water pressure fault signal to fault detection circuit on interface assembly.
- Fault detection circuit lights appropriate fault indicator immediately, and deenergizes pump motor relay which removes power from the pump motor when the fault condition has existed for 8 seconds.
- Interface assembly senses fault signal, deenergizes interface fault control relay, and sends Chiller Fault.

Low water pressure fault causes the following to occur:

- Pressure control assembly senses the low water pressure fault condition and sends fault signal to the fault detection circuit on interface assembly.
- Fault detection circuit lights appropriate fault indicator when the fault condition has existed for 5 seconds, and deenergizes pump motor relay which removes power from the pump motor when the fault condition has existed for 8 seconds.

- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault.

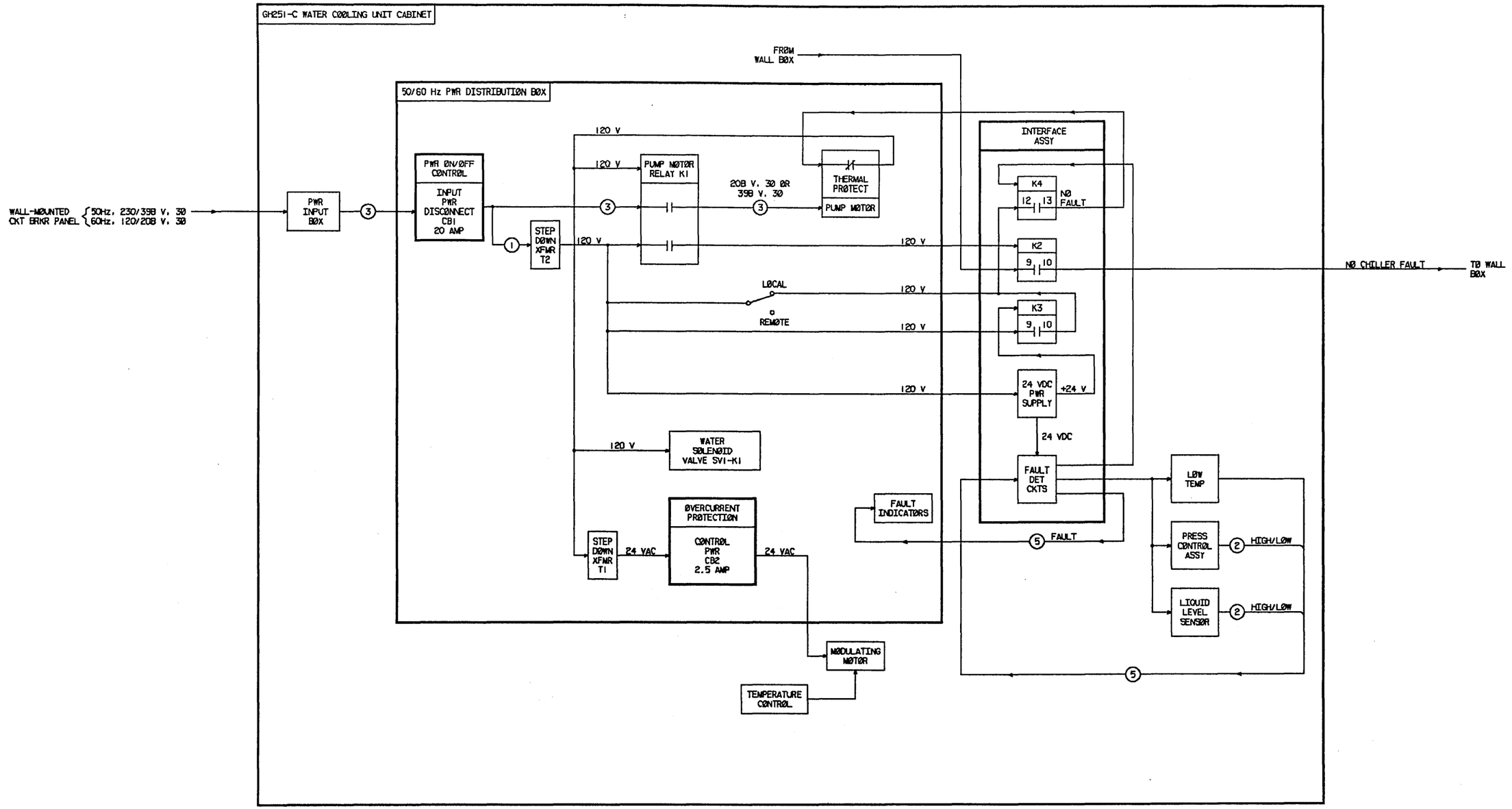
GH251-C Low Temperature Fault

- Dew point sensor assembly senses the formation of condensation caused by a lowering room temperature. This results in a fault signal being sent to U5 of the fault detection circuit on the interface assembly via J4-1. Normal voltage at pin 11 of U5 if 9 V, and a fault is indicated by less than 8 V.

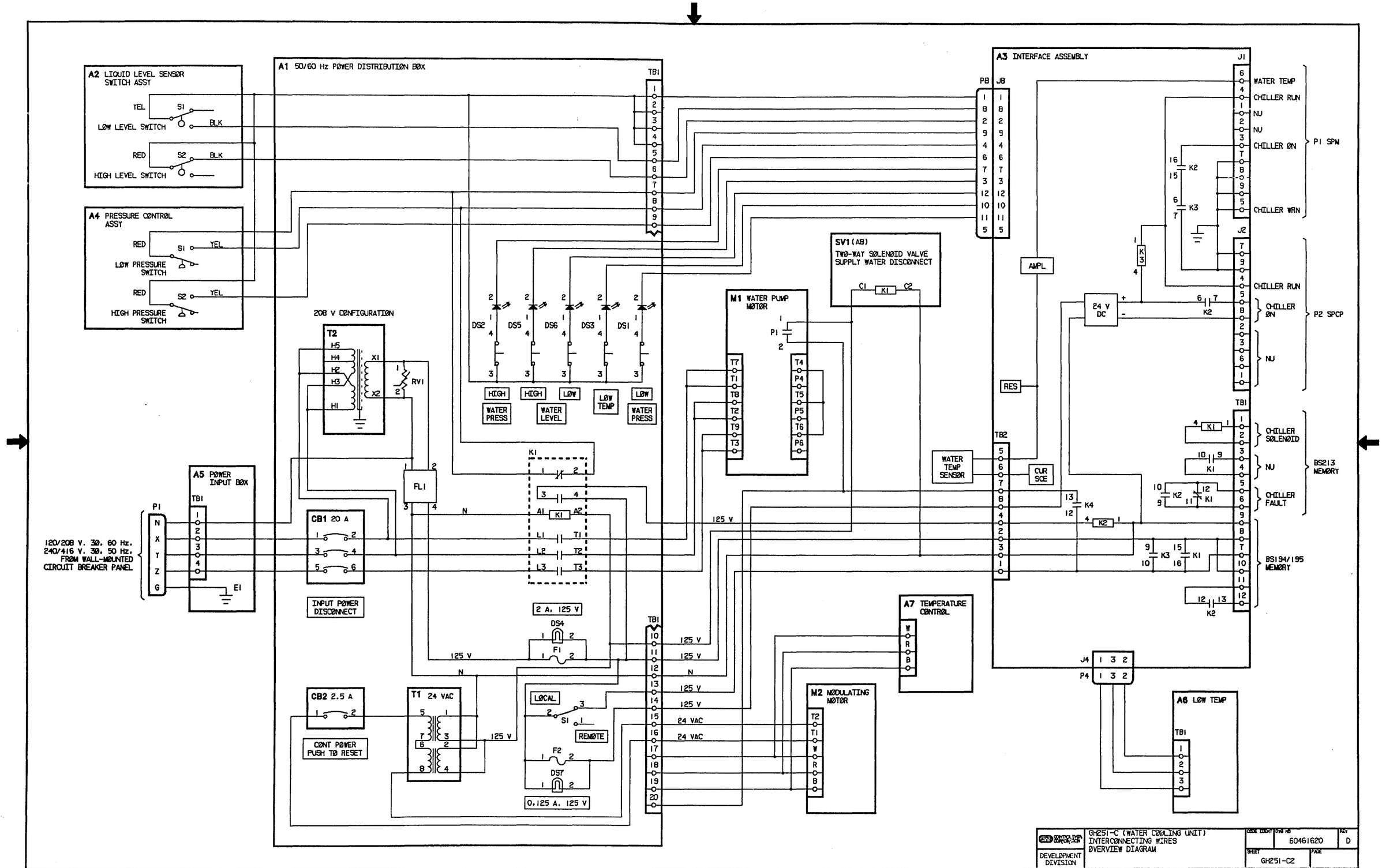
- Fault detection circuit lights appropriate fault indicator immediately, and deenergizes pump motor relay which removes power from the pump motor when the fault condition has existed for 8 seconds.

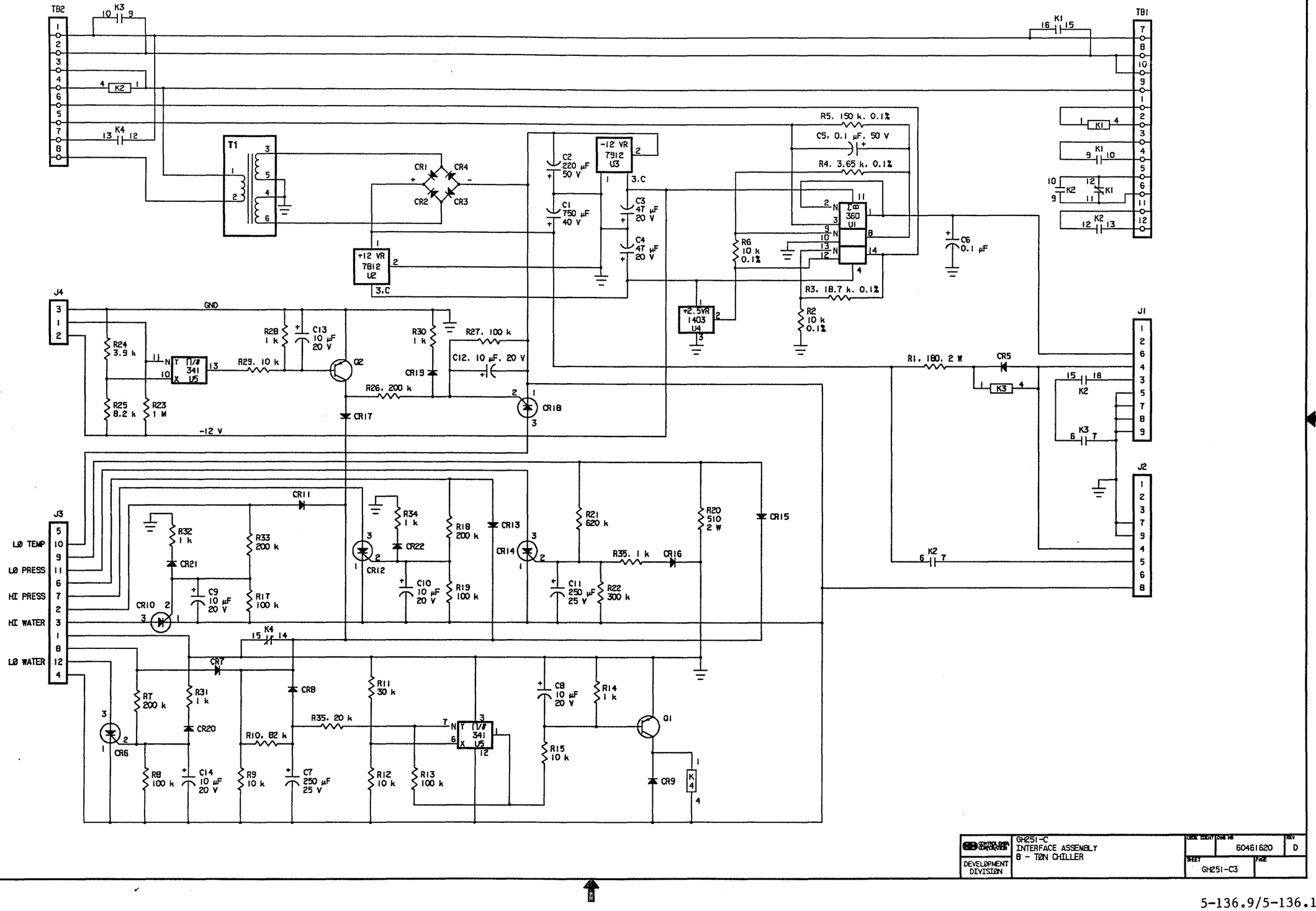
- Interface assembly senses fault signal, deenergizes interface assembly fault control relay, and sends Chiller Fault.

The fault indicator LEDs latch on for a fault. All of the LEDs are of the press to reset type. All of the LEDs respond instantly, except LOW WATER PRESS which requires that the fault must last 5 seconds before the LED latches. Each of the five previously discussed faults causes capacitor A3C7 to charge (about 8 seconds). When pin 7 of U5 reaches 7 V, relay K4 deenergizes. If the fault ceases to exist before the 8 second charge period expires, the charging of A3C7 stops and K4 remains energized.



DEVELOPMENT DIVISION	GH251-C (WATER COOLING UNIT) POWER DISTRIBUTION AND WARNING SYSTEM BLOCK DIAGRAM	60461620	D
		SHEET GH251-C1	PAGE


A2 LIQUID LEVEL SENSØR SWITCH ASSY
YEL
S1
BLK
LØW LEVEL SWITCH
RED
S2
BLK
HIGH LEVEL SWITCH
A4 PRESSURE CØNTRØL ASSY
RED
S1
YEL
LØW PRESSURE SWITCH
RED
S2
YEL
HIGH PRESSURE SWITCH
A1 50/60 Hz PØWER DISTRIBUTIØN BØX
TB1
208 V CØNFIGURATIØN
T2
H5
H4
H2
H3
H1
X1
X2
RV1
DS2
DS5
DS6
DS3
DS1
HIGH WATER PRESS
HIGH WATER LEVEL
LØW
LØW TEMP
LØW WATER PRESS
K1
FL1
A5 PØWER INPUT BØX
P1
TB1
N
X
Y
Z
G
E1
120/208 V. 3Ø. 60 Hz.
240/416 V. 3Ø. 50 Hz.
FRØM WALL-MØUNTED
CIRCUIT BREAKER PANEL
CB1 20 A
INPUT PØWER DISCØNNECT
CB2 2.5 A
CØNT PØWER PUSH TØ RESET
T1 24 VAC
LØCAL
S1
REMØTE
F2
DS7
0.125 A. 125 V
2 A. 125 V
DS4
F1
125 V
N
24 VAC
A3 INTERFACE ASSEMBLY
P8
J8
J1
J2
TB1
TB2
AMPL
RES
CUR SCE
WATER TEMP SENSØR
WATER TEMP
CHILLER RUN
NU
CHILLER ØN
CHILLER WRN
P1 SPN
K2
K3
24 V DC
CHILLER ØN
P2 SPCP
CHILLER SØLENØID
BS213 MEMØRY
CHILLER FAULT
BS194/195 MEMØRY
SV1 (A8)
TWØ-WAY SØLENØID VALVE
SUPPLY WATER DISCØNNECT
C1
C2
M1 WATER PUMP MØTØR
P1
M2 MØDULATING MØTØR
A7 TEMPERATURE CØNTRØL
J4
P4
A6 LØW TEMP
GH251-C (WATER CØØLING UNIT)
INTERCØNNECTING WIRES
ØVERVIEW DIAGRAM
DEVELØPMENT DIVISION
60461620
D
GH251-C2


TB2
TB1
J1
J2
J3
J4
K1
K2
K3
K4
T1
CR1
CR2
CR3
CR4
C1 750 µF 40 V
C2 220 µF 50 V
C3 47 µF 20 V
C4 47 µF 20 V
C5, 0.1 µF, 50 V
C6 0.1 µF
-12 VR 7812 U3
+12 VR 7812 U2
+2.5VR 1403 U4
LM 360 U1
R1, 180, 2 W
R2 10 k 0.1%
R3, 18.7 k, 0.1%
R4, 3.65 k, 0.1%
R5, 150 k, 0.1%
R6 10 k 0.1%
GND
-12 V
R23 1 M
R24 3.9 k
R25 8.2 k
R26, 200 k
R27, 100 k
R28 1 k
R29, 10 k
R30 1 k
C12, 10 µF, 20 V
C13 10 µF 20 V
CR17
CR18
CR19
Q2
LØ TEMP
LØ PRESS
HI PRESS
HI WATER
LØ WATER
R17 100 k
R18 200 k
R19 100 k
R21 620 k
R22 300 k
R31 1 k
R32 1 k
R33 200 k
R34 1 k
R35, 1 k
R35, 20 k
RT 200 k
C9 10 µF 20 V
C10 10 µF 20 V
C11 250 µF 25 V
CR10
CR11
CR12
CR13
CR14
CR15
CR16
CR21
CR22
R10, 82 k
R11 30 k
R12 10 k
R13 100 k
R14 1 k
R15 10 k
R20 510 2 W
C7 250 µF 25 V
C8 10 µF 20 V
C14 10 µF 20 V
CR6
CR7
CR8
CR9
CR20
Q1
R8 100 k
R9 10 k
GH251-C
INTERFACE ASSEMBLY
8 - TØN CHILLER
DEVELOPMENT DIVISION
60461620
D
GH251-C3

GH252-A WATER COOLING UNIT

The GH252-A power system consists of power distribution circuitry and control/protect circuitry.

GH252-A Power Distribution and Application

The power distribution box provides 208 or 416-V, three-phase, 50/60-Hz power to the pump motor and 12 and 24-V ac to the temperature regulator board. Transformer T1 allows use of 208 or 416-V ac by connecting the primary accordingly. T2 steps the primary voltages down from 120-V ac to 12 and 24-V ac. CB1 is the main input circuit breaker and serves as a manual power application/removal switch. CB2 and CB3 provide internal circuit protection. Refer to diagrams GH252-1 through GH252-5 for the Power and Protection diagram and associated schematics for the GH252-A.

If site ac is present and the circuit breakers are on, 12-V ac goes to the temperature regulator board. A Remote 2 signal from the SPM or 120-V ac from the power distribution box causes relay K3 on the temperature board to energize if no faults exist. Contacts K3A close causing K1 in the power distribution box to energize. 208 or 416-V ac then goes to the pump motor and 24-V ac goes to the temperature board. 120-V ac for activating K3 in the temperature board comes from an internal source when the power distribution box REMOTE/LOCAL switch is set to LOCAL. When set to REMOTE, 120-V ac comes from a TMPC or SPCP (when used). If the pump motor or one or more of the three K1 coils overheats, power is removed from the pump motor. An overheating pump motor opens the internal protection elements. This opens the overload line and deenergizes K1. An overheating K1 coil opens the related K1 protect contact and deenergizes K1.

GH252-A Control/Protect

The temperature regulator board contains control and protection circuits.

GH252-A Control

The GH252-A controls the temperature of the system cooling water by means of a motor-driven valve which adjusts the water flow in the cooling lines. Control information comes from the SPM or internally depending on the setting of the MANUAL/AUTO switch.

The environmental temperature and relative humidity signals from the SPM are added on the temperature regulator board. The result goes to the control circuit (AUTO mode only) which generates heat and cool signals to drive the modutrol motor. The modutrol motor opens or closes the valve, increasing or decreasing water flow as required to maintain proper equipment temperature. The Heat/Cool Adj signal is a feedback signal to the control circuit. In the AUTO mode of operation, the MANUAL/AUTO switch is closed and the K4 relay contacts are closed. The relative humidity and environmental temperature signals from the SPM then control the water temperature. The WATER TEMP ^{o}C potentiomenter sets the lower water temperature limit in AUTO mode. In MANUAL mode, the MANUAL/AUTO switch is open and the K4 contacts are open. The setting of the WATER TEMP ^{o}C potentiometer then determines the water temperature in the cooling lines. 24-V ac applied to the modutrol motor releases a brake and allows motor operation.

GH252-A Protection

Protection circuits relate to water pressure, water level, and temperature faults. A fault is common to all but one of the protection circuits.

GH252-A Fault Relay: All protection circuits except the low level warning circuit are ORed. The output of this OR gate deenergizes relay K2 and activates the fault relay time delay when a fault occurs. Deenergizing K2 causes the Warning signal to go to the wall box via K2A or K2B. The time delay sets the K1 fault latching relay if a fault still exists after the delay expires. Setting the fault relay opens contacts K1A which removes power from K3 and K2. Open contacts K3A removes power from the pump motor and open contacts K3B removes Run signal from the SPM. Once set, the fault relay remains set until a manual reset occurs.

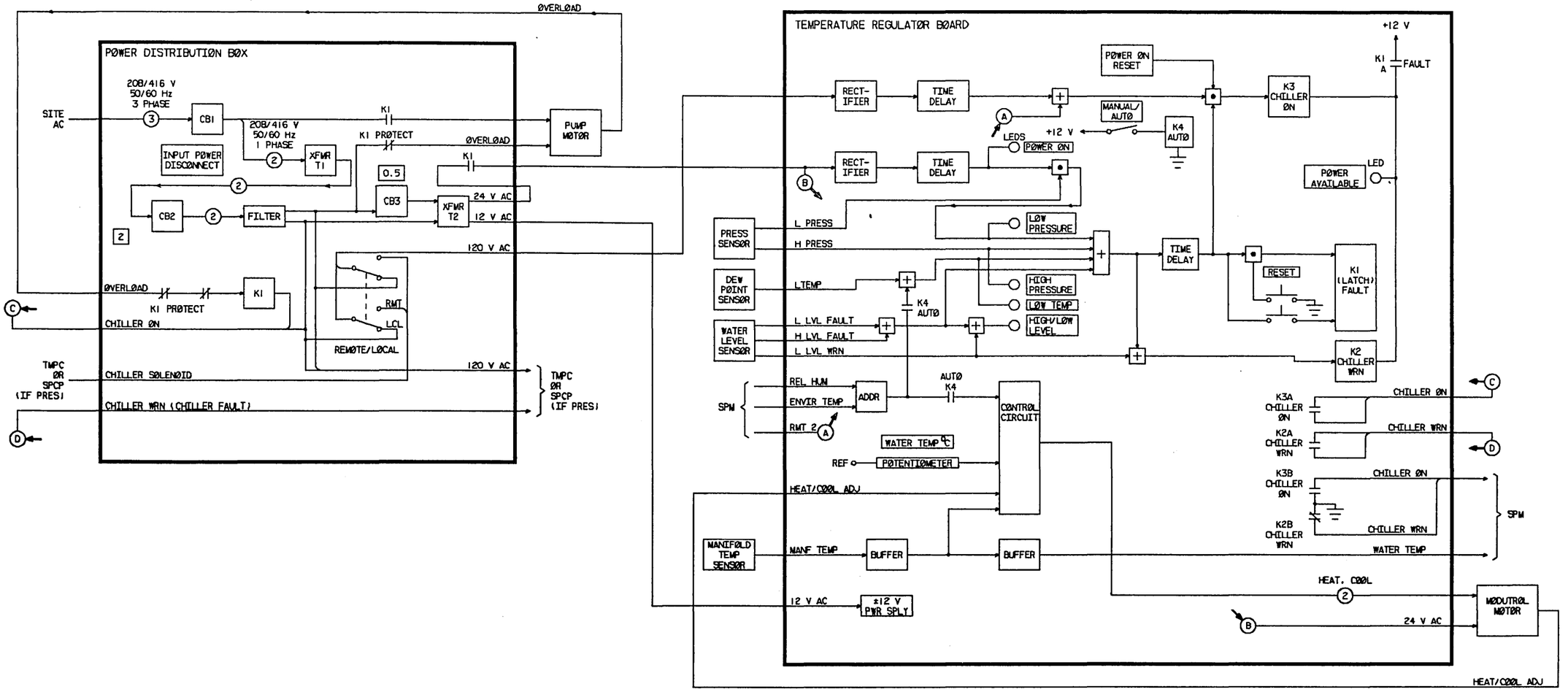
GH252-A Low Pressure Fault: A low pressure fault occurs when the pressure in the cooling lines decreases to 20 psi with power applied to the pump motor (24-V ac is applied to the temperature board). This lights the low pressure LED, deenergizes relay K2, and activates the fault relay time delay. Refer to Fault Relay in this section.

GH252-A High Pressure and Low Temperature Faults: A high pressure fault occurs when pressure in the cooling lines reaches 60 psi. A low temperature fault indicates condensation on the tube that feeds the output manifold or if the manifold is in a remote location on the output manifold itself. These faults light the appropriate LED, deenergize relay K2, and activate the fault relay time delay. Refer to Fault Relay in this section.

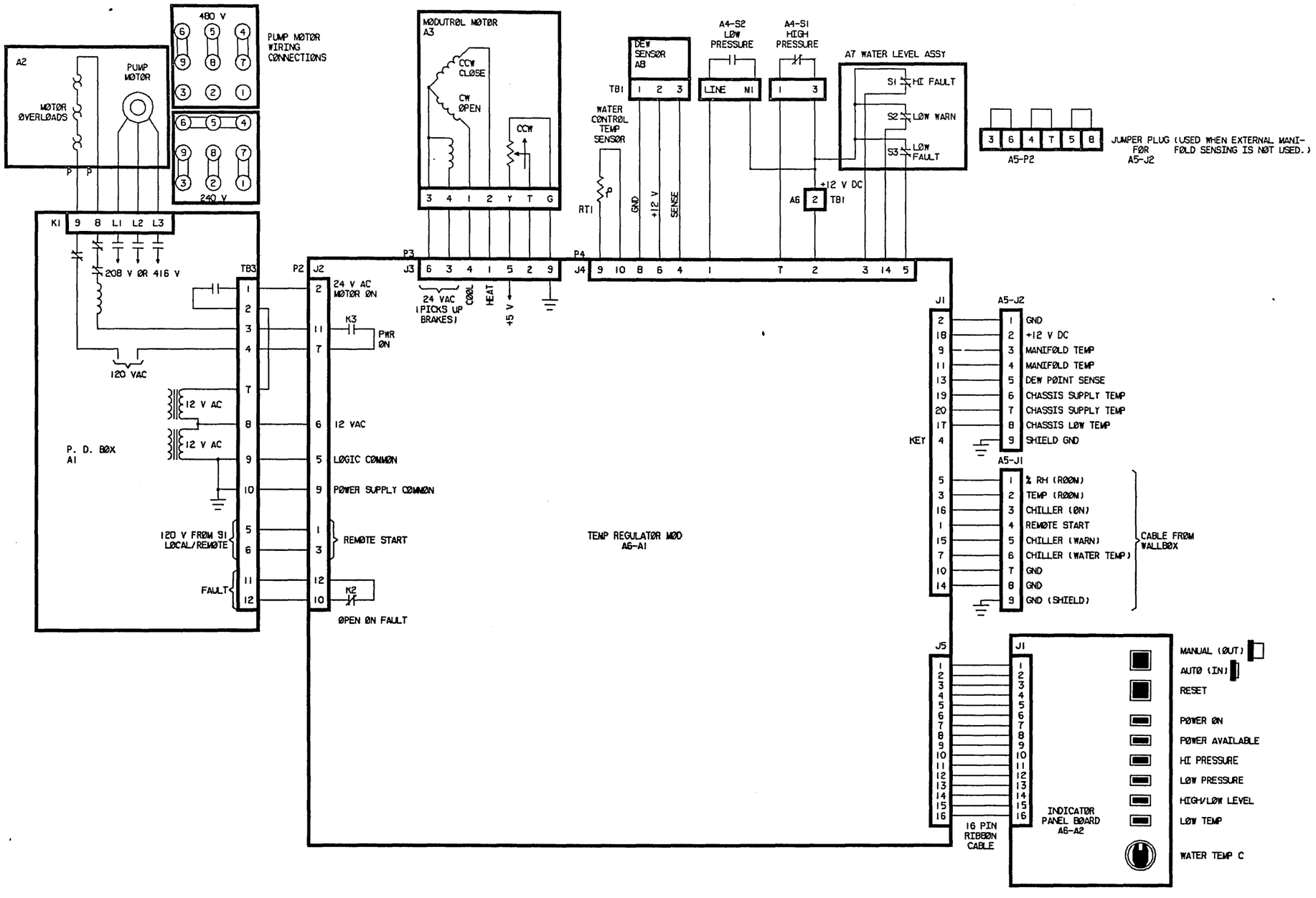
GH252-A Low Level and High Level Faults: A low level fault indicates the water tank level is less than approximately one-third full. High level fault indicates the water tank is more than approximately three-fourths full. These faults light the HIGH/LOW LEVEL LED, deenergize relay K2, and activate the fault relay time delay. Refer to Fault Relay in this section.

GH252-A Low Level Warning: A low level warning lights the HIGH/LOW LEVEL LED and sends Warning to the wall box. It does not activate the fault relay time delay. Low level warning occurs when the water tank level is less than approximately one-half full.

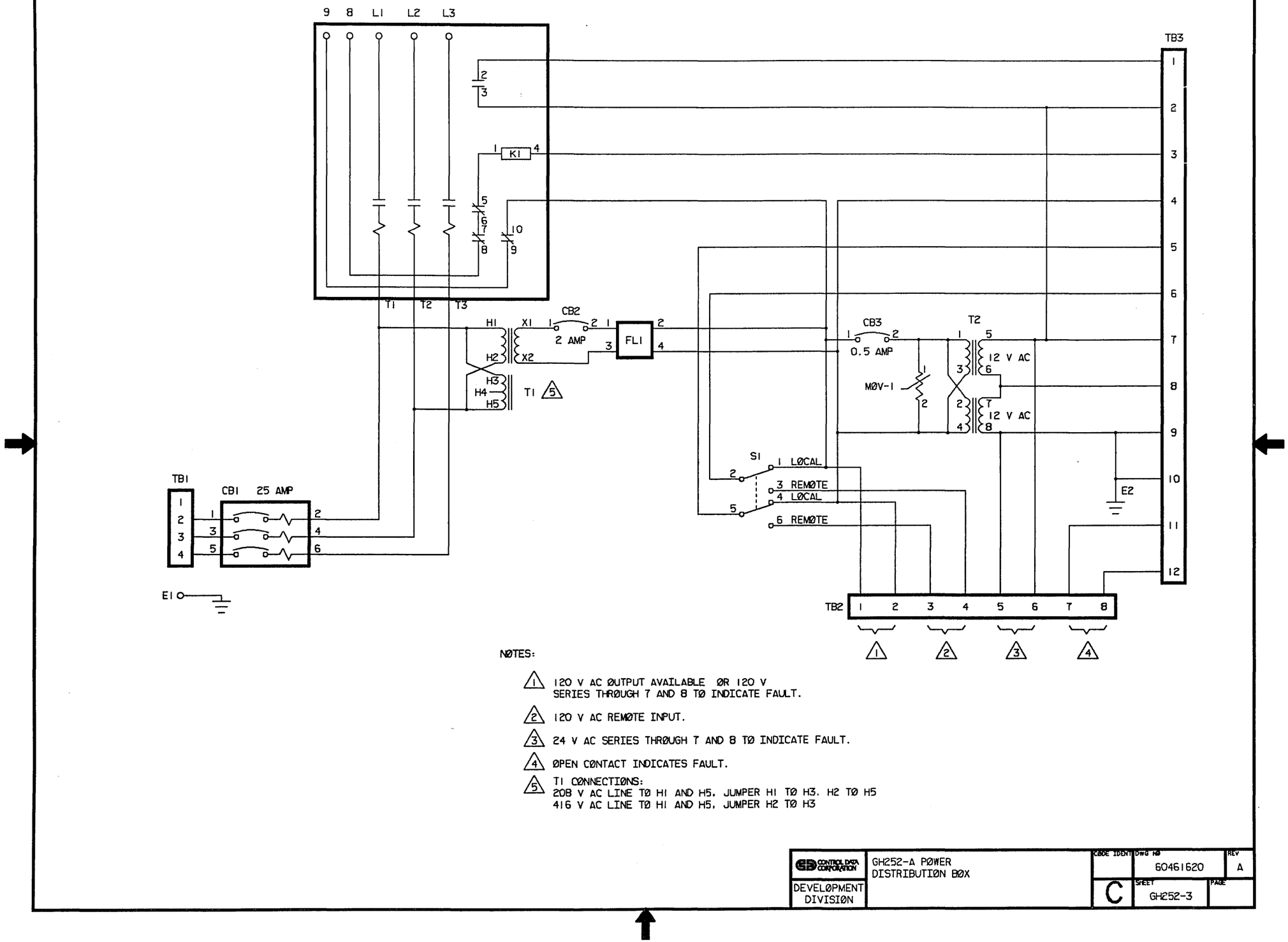
GH252-A Environmental Temperature and Relative Humidity (from SPM): If the cable containing the environmental temperature and relative humidity signals from the SPM is not connected to the temperature regulator board, the LOW TEMP LED lights (AUTO mode only).



DEVELOPMENT DIVISION	GH252-A PØWER AND PRØTECTIØN	60461620	A
		SHEET GH252-1	



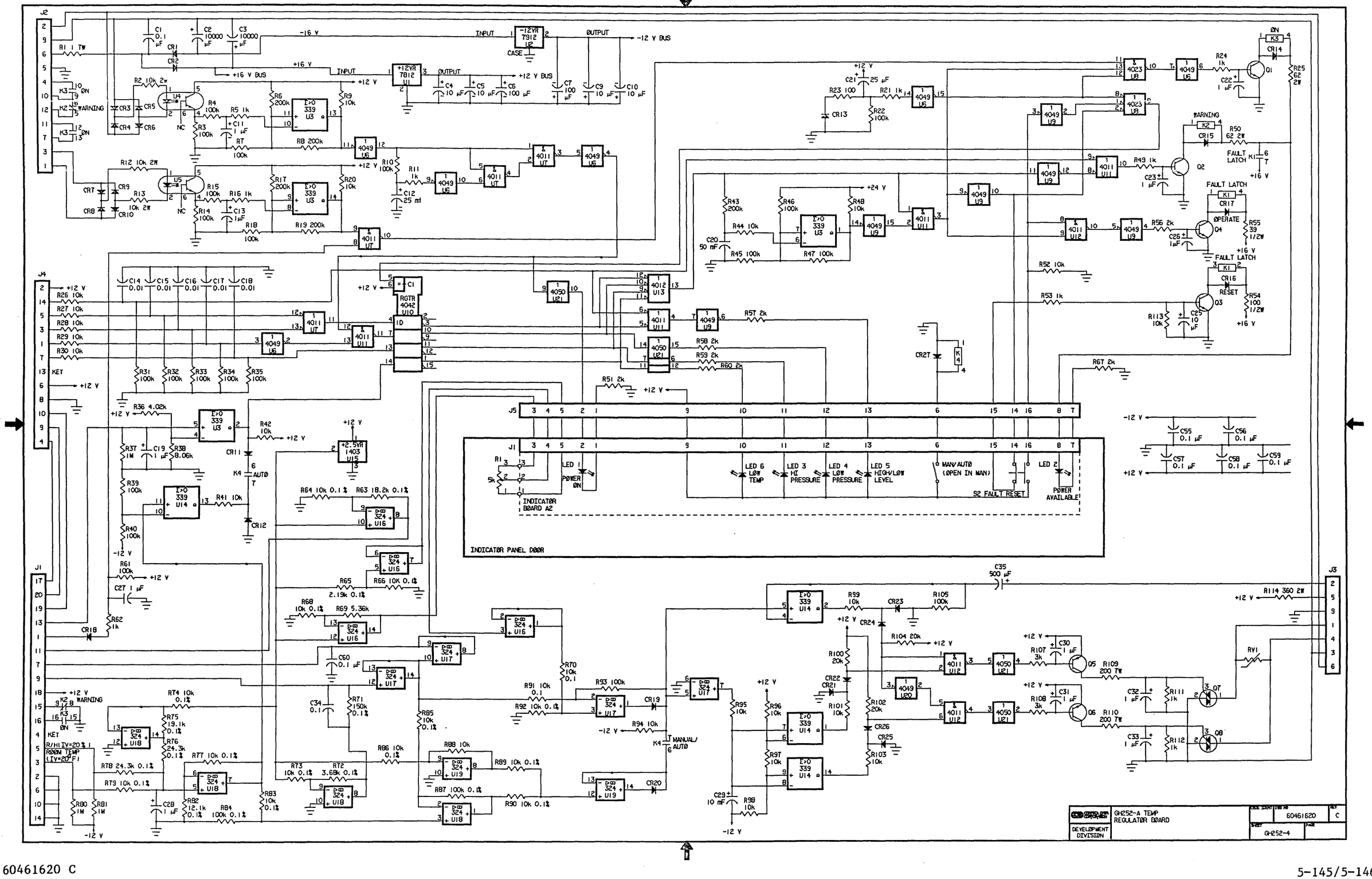
DEVELOPMENT DIVISION	GH252-A CABINET	60461620	A
		SHEET GH252-2	



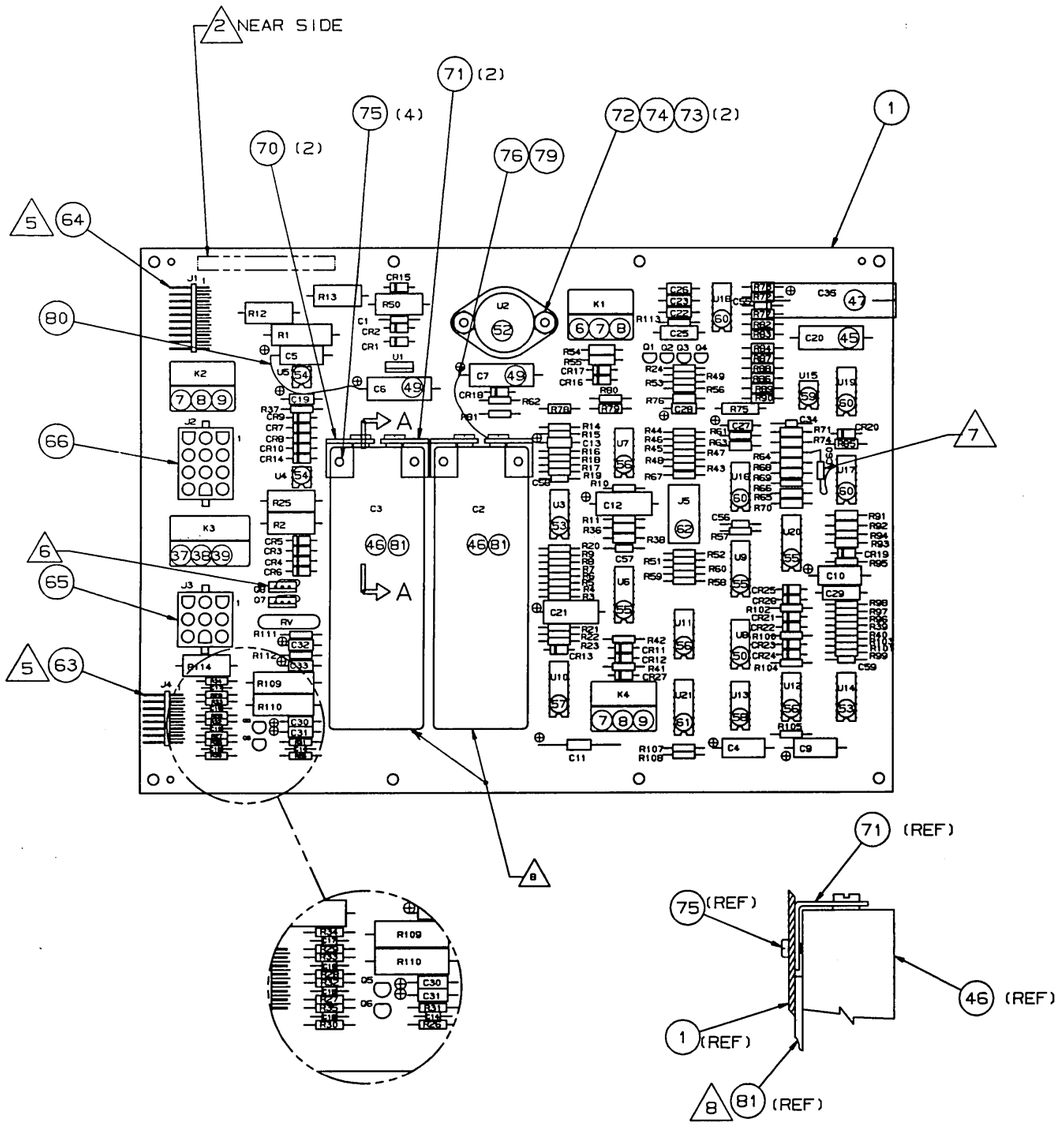
NOTES:

1. 120 V AC OUTPUT AVAILABLE OR 120 V SERIES THROUGH 7 AND 8 TO INDICATE FAULT.
2. 120 V AC REMOTE INPUT.
3. 24 V AC SERIES THROUGH 7 AND 8 TO INDICATE FAULT.
4. OPEN CONTACT INDICATES FAULT.
5. T1 CONNECTIONS:
   208 V AC LINE TO H1 AND H5, JUMPER H1 TO H3, H2 TO H5
   416 V AC LINE TO H1 AND H5, JUMPER H2 TO H3

CONTROL DATA CORPORATION	GH252-A POWER DISTRIBUTION BOX	CODE IDENT	DWG NO 60461620	REV A
DEVELOPMENT DIVISION		C	SHEET GH252-3	PAGE


-16 V
+16 V BUS
INPUT
OUTPUT
-12 V BUS
+12 V BUS
+12 V
+24 V
-12 V
WARNING
ON
FAULT LATCH
OPERATE
RESET
MANUAL/AUTO
KEY
RGTR 4042 U10
INDICATOR BOARD A2
INDICATOR PANEL DOOR
LED 1 POWER ON
LED 6 LOW TEMP
LED 3 HI PRESSURE
LED 4 LOW PRESSURE
LED 5 HIGH/LOW LEVEL
MAN/AUTO (OPEN IN MAN)
S2 FAULT RESET
LED 2 POWER AVAILABLE
GH252-A TEMP REGULATOR BOARD
DEVELOPMENT DIVISION
60461620
C
GH252-4

REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APVD
B	CA 46857	CLASS A DWG	LRH	05-02-85	AP	TO
C	CA 47755	SEE E.C.O.	LH	4/01/86		



SECTION A-A

F/N	REF DESIGNATION/LOCATION	QTY
2	Q1,Q2,Q3,Q4	4
3	Q5,Q6	2
4	Q7,Q8	2
5	CR1-CR27	27
10	R11,R16,R21,R24,R49,R53,R62 R111,R112,R5	10
11	R3,R4,R7,R10,R14,R15,R18,R22, R23,R31-R35,R39,R40,R45,R46, R47,R61,R105	21
12	R6,R8,R17,R19,R43	5
13	R9,R20,R26-R30,R41,R42,R44, R48,R52,R94-R99, R101,R103,R113	21
14	R37,R80,R81	3
15	R38	1
16	R64,R66,R68,R70,R73,R74,R77, R79,R83,R85,R86,R88,R89,R90, R91	15
17	R84,R87,R92,R93	4
18	R76,R78	2
19	R63	1
20	R65	1
21	R69	1
22	R71	1
23	R72	1
24	R75	1
25	R82	1
26	R107,R108	2
27	R36	1
28	R1	1
29	R2,R12,R13	3
30	R51,R56,R57,R58,R59,R60,R67	7
31	R25,R50	2
32	R54	1
33	R55	1
34	R100,R102,R104	3
36	R109,R110	2
40	C14-C18,C34	6
41	C1,C55,C56,C57,C58,C59,C60	6
42	C11,C13,C19,C22,C23,C26,C27, C28,C30,C31,C32,C33	12
43	C25,C29	2
44	C12,C21	2
48	C4,C5,C9,C10	4
50	U8	1
51	U1	1
61	U21	1
67	RV	1
68	R114	1

NOTES:

1. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
2. MARK APPLICABLE PART NO. AND REVISION PER SPEC 10121508.
3. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
4. ESD PROCEDURES FOR HANDING THE ASSEMBLY SHALL BE FOLLOWED PER SPEC 1.60.010.
5. PRIOR TO MOUNTING, CLIP OFF PIN 4 OF J1 AND PIN 13 OF J4 FLUSH WITH CONNECTOR MATING SIDE ONLY.
6. SEE HI STEPS 3 THRU 6
7. SEE HI STEPS 16 AND 17.
8. SPREAD A WIDE STRIP OF RTV ON THE BOARD SIDE OF C2 AND C3 BEFORE THE CAPACITORS ARE MOUNTED.

HI	23142072
HM	23142072
PL	23142072
DETACHED LISTS	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN TOLERANCES
PLACE ± PLACE ± PLACE ± ANGLES ±
MATERIAL
FINISH

DWN	L.R.HILL	4-01-85
CHKD	A.POWERS	10-14-85
ENGR	T.J.O'CONNOR	10-14-85
MFG	B.J.REILAND	10-14-85
APVD	T.J.O'CONNOR	10-14-85
X	X	X

EQUIP. NO. GH251A
THIRD ANGLE PROJECTION

ANSI 1982

CONTROL DATA — ARDEN HILLS OPERATIONS ST. PAUL, MINN.

TITLE
MODULE ASSEMBLY
TEMP REG.
24 TON

SIZE D | FSCM NO. 34010 | DWG NO. 23142072
DWG SCALE 1.0 | PLOT SCALE 1.0 | SHEET 1 OF 1

CAD 2

AB115-A IOU POWER DISTRIBUTION AND WARNING SYSTEM †

The AB115-A has a 50/60-Hz power-control box (PCB) with related fault circuits and a 400-Hz PCB. Refer to the AB115-A Power Distribution and Warning System Block Diagram (AB115-1).

AB115-A 50/60-Hz Power Distribution

The AB115-A cabinet receives 50/60-Hz line voltage at its 50/60-Hz PCB. This 50/60-Hz power activates the cabinet fans and condensing unit when each cabinet's 50/60-Hz PCB control logic receives a Start/Run command.

The Start/Run command can result from either a local SPM power-on or a remote SPM Start signal, depending on the position of the mode switch on the 50/60-Hz PCB. The local power-on occurs at a push-button switch on the 50/60-Hz PCB, and Start originates at the SPM. Start, in turn, can be either a local Start from a push-button switch on the SPM or a remote Start from a master system, depending on the position of the mode switch on the SPM. Start goes to all AB115-A cabinets in parallel, so that the entire system can be powered-on and off with one signal.

AB115-A 400-Hz Power Distribution

With M-G power-on, the 400-Hz M-G voltage goes to the 400-Hz PCB. The control logic in the 50/60-Hz PCB energizes relays in the 400-Hz PCB when Start/Run occurs and 400-Hz voltage from the MG is present at the 400-Hz PCB. The relay contacts pass the 400-Hz voltage to transformers and low-voltage power supplies that develop the dc logic voltages for the cabinet. The 50/60-Hz PCB fault detection logic opens this relay and interrupts 400-Hz power to the cabinet if a cabinet environment fault or loss of M-G power occurs, as described below.

AB115-A Faults

Each 50/60-Hz PCB reacts to cabinet environment fault conditions and loss of cabinet M-G voltage as follows:

- All cabinet environmental faults - Lights appropriate LED on 50/60-Hz PCB front panel.
- Low temperature fault - Sends a Long Warning status signal to the cabinet logic and removes power from the cabinet in two minutes.
- High temperature fault, blower failure, condensing unit compressor failure - Removes power from cabinet in 2.5 seconds and opens relay in the 400-Hz PCB. Also sends a Short Warning status signal to the master system via the Short Warning daisy chain.
- Smoke detection - One or more of four cabinet-mounted LEDs light and all logic power supply circuit breakers and the 400-Hz DISCONNECT circuit breaker on the 400-Hz PCB open.
- Loss of cabinet M-G voltage - Removes power from the cabinet blowers and condensing unit and opens the relay in the 400-Hz PCB after a two-minute delay.

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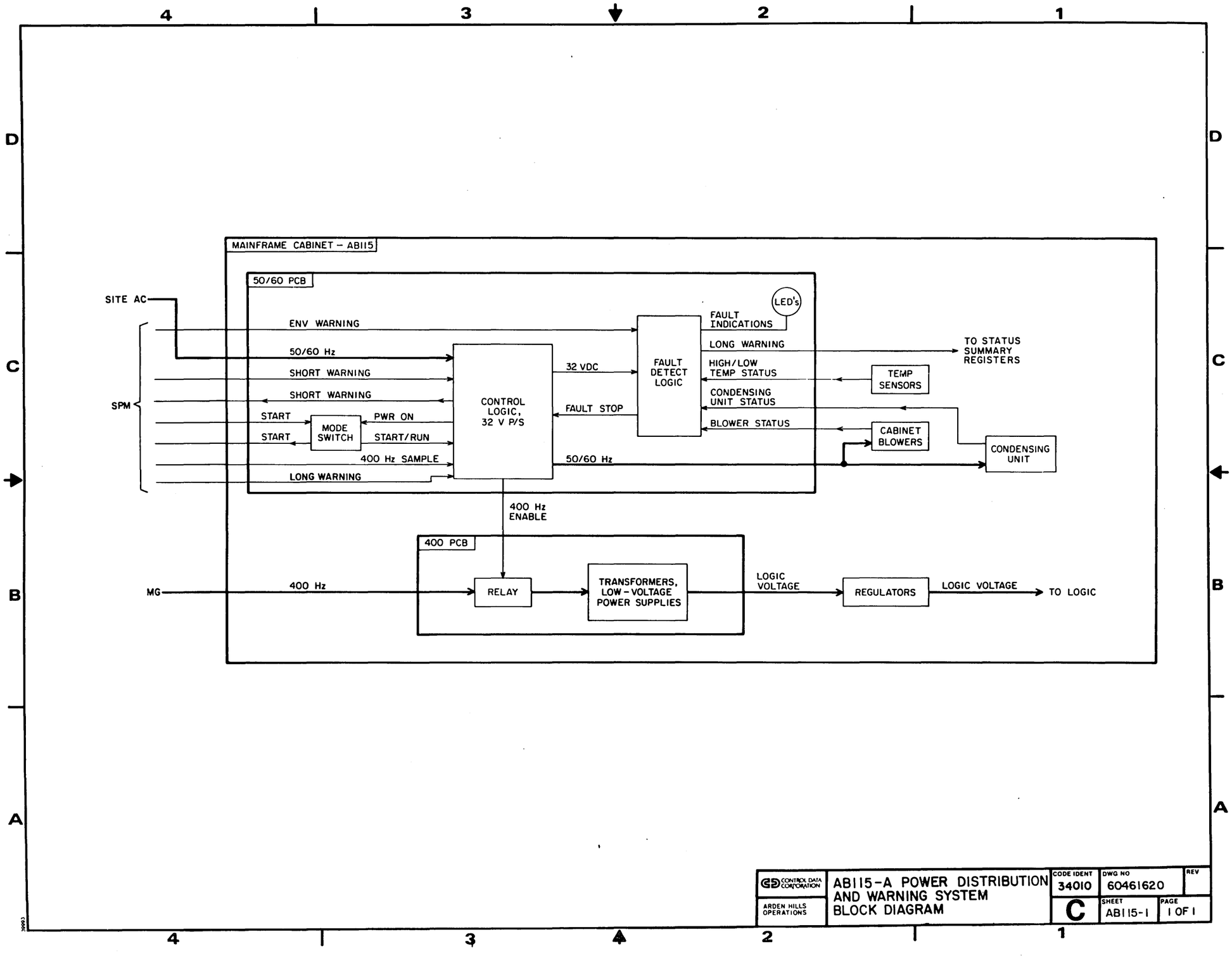
† For information on which systems use the AB115-A, refer to Basic System Configuration in General Description, section 1.



CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	AB115-A POWER DISTRIBUTION AND WARNING SYSTEM BLOCK DIAGRAM	CODE IDENT 34010	DWG NO 60461620	REV
		C	SHEET AB115-1	PAGE 1 OF 1

AB115-A 50/60-Hz Power Control Box

The 50/60-Hz PCB (AB115-2) performs the following functions:

1. Enables transfer of 400-Hz MG through the 400-Hz PCB to the low-voltage logic power supplies.

2. Enables transfer of 50/60-Hz power to the cabinet condensing unit and fans.

3. Detects and reacts to the following cabinet environmental faults:

   - Blower failure
   - Low cabinet temperature (cabinet approaching condensation warning level)
   - Condensing unit failure
   - High cabinet temperature, three levels: 35 °C (95 °F), 43.3 °C (110 °F), 54.4 °C (130 °F)
   - Cabinet smoke

4. Removes power from the cabinet for blower failure, low cabinet temperature, and condensing unit failure, or second-level high temperature. Sends a status signal to the cabinet logic for low temperature or first-level high temperature; sends a status signal to the processor for cabinet blower failure, condensing unit failure, or second-level high temperature; removes 400-Hz power from the logic power supplies in the 400-Hz PCB for third-level high temperature or cabinet smoke. Displays presence of blower failure, low cabinet temperature, and condensing unit failure, or second-level high temperature by cover panel indicator lights.

5. Senses loss of 400-Hz M-G output and removes power from cabinet.

6. Enables local or remote control of cabinet power.

7. Enables cabinet power ride-through of transient source power fluctuations.

The following paragraphs describe these functions in the context of power-on and power-off sequence under local and remote control, and under normal and environmental fault conditions.

AB115-A Cabinet Power Activation

Placing the MAIN POWER DISCONNECT circuit breaker (CB1) to the ON (up) position applies 50/60-Hz, one-phase power through buck-boost transformer T1 and line filter FL1 to T2. The configuration of T1 is adjustable to TB1 to produce 230-V ac from input voltages of 120/208-V, 220/380-V, or 240/416-V ac.

The output winding of T2 supplies 115-V ac through P2/J2-3/10 and P4/J4-3/2 to the cabinet condensing unit, and returns via P4/J4-4 to energize K4, unless the compressor high head pressure switch is open.

Four sensing lines return sample 400-Hz, three-phase, and neutral from the 400-Hz PCB to the 50/60-Hz PCB at P8/J8 pins 2/14/15/16. If 400-Hz DISCONNECT on the 400-Hz PCB (CB5) is in the ON position and the MG is producing 400-Hz power, K13 and K14 energize, energizing K12.

AB115-A Local Mode

With the CONTROL switch (S4) in the LOCAL position, switches on the 50/60-PCB control application of 50/60-Hz power to the cabinet blowers and condensing unit solenoids, and 400-Hz power to the cabinet logic power supplies.

AB115-A Power-On

Pressing POWER ON (S1) applies 115-V ac to T3 which applies 24-V ac to the fault detection power supply (CR1 through CR4 and C1). The fault detection power supply produces +32-V for the fault LEDs (DS1 through DS5) and energizes K7, K8, and K11. K7 and K8 indicate a cabinet blower failure when deenergized and control fault LEDs DS5 and DS1; K11-9/10 lock in 115-V ac to T3 so that the fault detection power supply remains activated, even if K2 deenergizes and removes cabinet power. This keeps power to the fault LEDs after a fault has powered-off the cabinet.

K11-12/13 also apply 115-V ac to the condensing unit blower and solenoids, via K12-15/16 and P4/J4-1; this starts the condensing unit compressor. If the AIRFLOW SENSOR TEST switch (S3) is not being held open (down), K11 and K12 also energize K1, sending 230-V ac to the cabinet blowers. The blowers keep the airflow sensor heating resistors (R1) below 65.6 °C (150 °C) so that K7 and K8 remain energized.

If cabinet temperature is in the operating range between 13.9 °C and 35 °C (57 °F and 95 °F), high temperature fault relay K9 energizes, and low temperature fault relay K5 and high temperature back-up fault relay K6 remain deenergized. Pins C3/C4 of momentary switch S1 provide the path to energize K3; K3 completes the path to energize K2 through K7, K8, K9, K4, and K11. K2 locks in POWER ON switch S1; deenergizing K2 powers-off the cabinet, except for the fault detection power supply.

K3 and K2 are time-delay dropout relays adjusted for dropouts of two minutes and 2.5 seconds, respectively, after power removal. With K11 energized, the hold-in path for K3 after S1 is released is through K5-8/9; the hold-in path for K2 after S1 is released is through K7, K9/K4 pins 9/10 and K8-16/15. If a fault condition exists that interrupts either of these paths, it must clear within the corresponding relay dropout period or cabinet power will be removed. K3 thus gives a two minute ride-through for a low temperature fault; K2 gives a 2.5-second ride-through for a high temperature fault or compressor fault, or transient loss of 50/60-Hz line voltage to cabinet blowers.

Energizing K2 also provides a path for energizing K1 in the 400-Hz PCB via P8/J8-3. K1 in the 400-Hz PCB enables 400-Hz voltage from the MG to the cabinet logic power supplies (refer to 400-Hz PCB text and schematic later in this section). The logic power supplies in the 400-Hz PCB also return circuit breaker trip coil lines to the 50/60-Hz PCB; if cabinet temperature reaches 54.5 °C (130 °F), K6 energizes and the contacts of K6 and P1/J1 pins 1/5/7/9 short these trip coil lines to ground. This trips the circuit breakers in the 400-Hz PCB to protect the logic circuits.

K6 also energizes and trips the low-voltage circuit breakers if any of the four cabinet smoke detectors activates; this protects the logic circuits in the event of a logic power short-circuit.

AB115-A Power-Off

POWER OFF (S2) is a pneumatic time-delay holdoff switch, adjusted for an open delay slightly longer than 2.5-second hold-on of K2. Pressing POWER OFF interrupts all 50/60-Hz power distribution within the cabinet except that the condensing unit via P2/J2-3/10. All relays then deenergize except K4 and condensing unit relay K1. The compressor continues to run until the coolant is pumped down; the low suction pressure switch in the condensing unit then opens, and K4 and condensing unit relay K1 deenergize.

AB115-A Remote Mode

With the CONTROL switch (S4) in REMOTE position, a remote system controls application of 50/60-Hz power to the cabinet blowers and condensing unit solenoids, and 400-Hz power to the cabinet logic power supplies.

AB115-A Power-On

Cabinet power activation is the same as previously described; from that point, the cabinet is powered on by the +24V Start signal entering P7-10 from pin 1 of the lower-numbered I/O panel jack (jack number is different for each cabinet). Start passes through the REMOTE position of S3 to K10 and K11; it then starts the system by energizing K11, as previously described. At the same time, Start goes to the next cabinet via the jumper across J7-10/12.

One to two seconds after K11 energizes, K10 energizes for approximately one-second. The one-second pulse of K10 is due to op-amp U2, whose sections form a one-shot. When the fault detection power supply initially applies +32-V through S4, U2-1 takes one to two seconds to build to +2-V; at that point, U2-7 goes to a +30-V, causing C19 and C20 to charge through R52. During this charge, which takes approximately one-second, U2-9 is a negative voltage, causing U2-8 to be a positive voltage; this turns on Q7 and energizes K10. At the end of the one-second time constant of C19/C20 and R52, U2-9 is +30-V, causing U2-8 to be zero volts; this turns off Q7 and deenergizes K10.

During this one-second energized time, K10 performs the same function in Remote mode that S1 performs in Local mode. K10-12/13 bypass K5-8/9 so that K3 can be energized even if an initial low temperature condition exists; this provides two minutes for system heat to clear the low temperature fault. K10-15/16 hold in power to K2 and K3 unit K2 energizes and K2-3/5 close. K10-8/9 momentarily remove +32-V from the fault LEDs to clear any fault display.

AB115-A Power-Off

If the remote system interrupts Start at P7-10, K11 deenergizes, opening the holding path for K1, K2, and K3 and the bypass path for the fault detection power supply (K11-9/10). The effect is the same as pressing POWER OFF (S2), as previously described for local mode, except that all cabinets in the system power-down.

The individual cabinet can also be powered-down at the cabinet by setting the CONTROL switch to LOCAL and pressing POWER OFF, without powering down the rest of the system cabinets. This is possible because the jumper across J7-10/12 always sends Start on to the next cabinet. The CONTROL switch must be in LOCAL to prevent an automatic reapplication of power from Start.

AB115-A Short/Long Warning

The remote system also sends a Short Warning to pin 2 of the lower-numbered I/O panel jack. If the condensing unit compressor is running, both cabinet blowers are running, and cabinet temperature is below 43.3 °C (110 °F), K4, K7, K8, and K9 are all energized and a Short Warning is passed on to the next cabinet. If any of these relays is deenergized, indicating a present or imminent temperature fault, the Short Warning daisy chain opens, deenergizing the Short Warning relay (K7) in the SPM and initiating a Short Warning status signal (status bit 59) to the cabinet.

The deenergized state of K4, K7, K8, or K9 opens the holding path or K2, which has a mechanically-delayed dropout, adjusted for 2.5 seconds. A Short Warning condition within the cabinet powers-down the cabinet in 2.5 seconds.

P7/J7 pins 6/5/13/14 go to the backpanel wiring to produce Long Warning (status bit 63).† Pins 5 and 13 are ground for logic reference; if the CONTROL switch is in the REMOTE position, pins 6 and 14 are normally connected through K5 and the high temperature warning sensor. If cabinet temperature drops to 13.9 °C (56 °F) or rises to 35 °C (95 °F), the Long Warning loop opens and the logic generates status bit 63. In the AB115-A cabinet, this loop also contains Environmental Warning (room temperature/dewpoint warning) from the SPM.

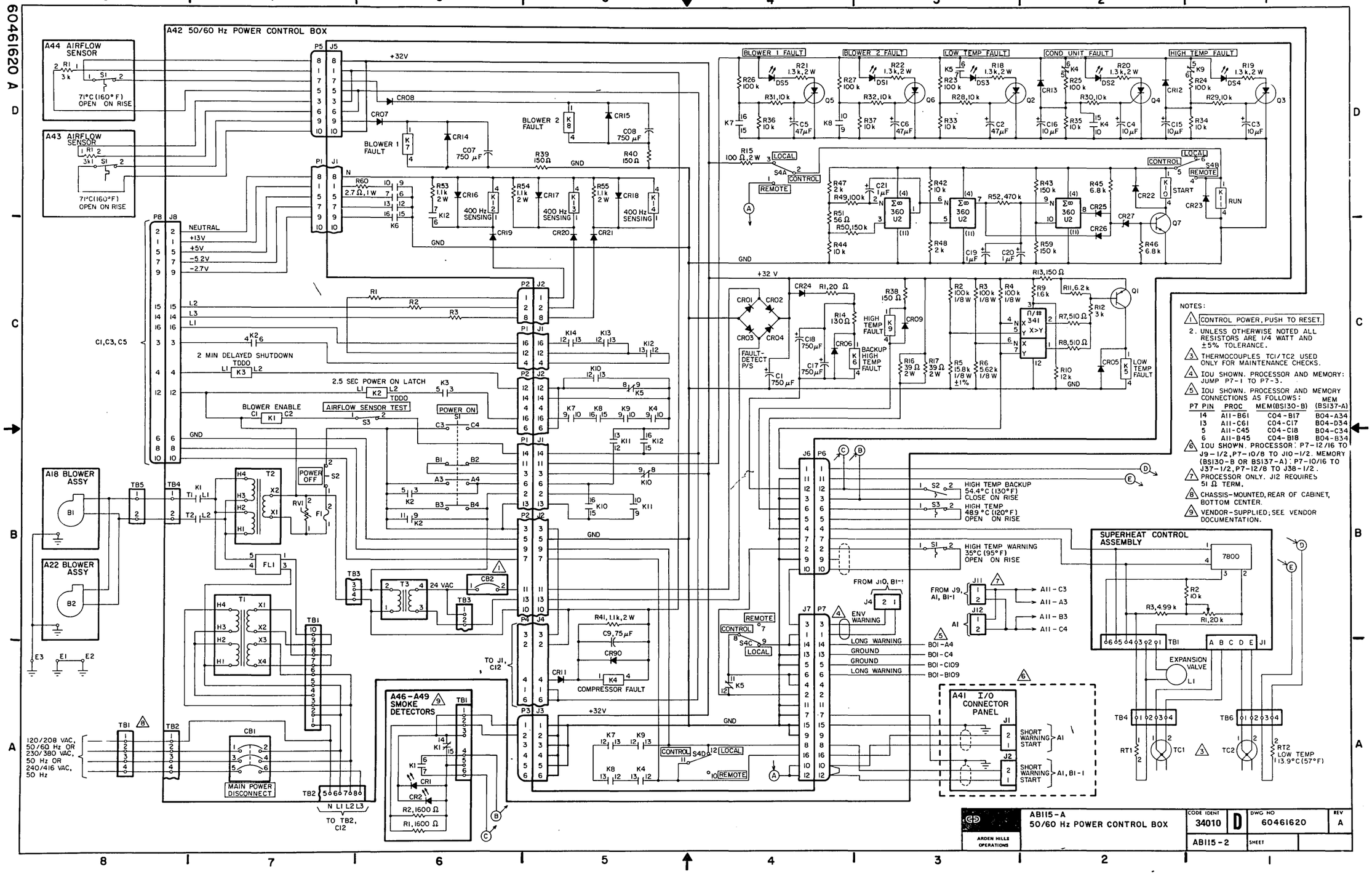
AB115-A Fault Indicators

The 50/60-Hz PCB displays five cabinet environmental faults by lighting front panel LEDs. The appropriate LED (DS1 through DS4) lights if either cabinet blower fails, if cabinet temperature reaches 13.9 °C (57 °F) or 43.3 °C (110 °F), or if the condensing unit compressor is not running. Each of these LEDs lights through a thyristor (Q2 through Q6); each thyristor acts as a switch and triggers by a gate voltage of +0.5 to +1-V.

K7 and K8 are normally energized, so their closed contacts apply ground to the gates of Q5 or Q6, keeping them cut off. If either blower fails, its sensing relay (K7 or K8) deenergizes; the gate of Q5 or Q6 then receives +3-V from the voltage divider across +32 V to ground. Q5 or Q6 then conducts fully, lighting LED DS5 or DS1. Once triggered, Q5 or Q6 remains fully conducting and the LED remains lit as long as voltage is present on the +32-V bus, even if K7 or K8 reenergize. To reset the LED, the POWER ON switch must be pressed momentarily interrupting the +32-V bus.

The same principle applies with DS2 through DS4, except that the fault relay contact is in series with the voltage divider. K5 is normally deenergized, and K4 and K9 are normally energized. The voltage dividers for thyristors Q2 through Q4 are, therefore, normally open, applying ground to their gates. A fault condition closes the voltage divider circuit from +32-V to ground, applying +3-V to the gate. The thyristor then conducts fully, lighting the LED.

†Refer to related information under section 1 heading, Cabinet Temperature.

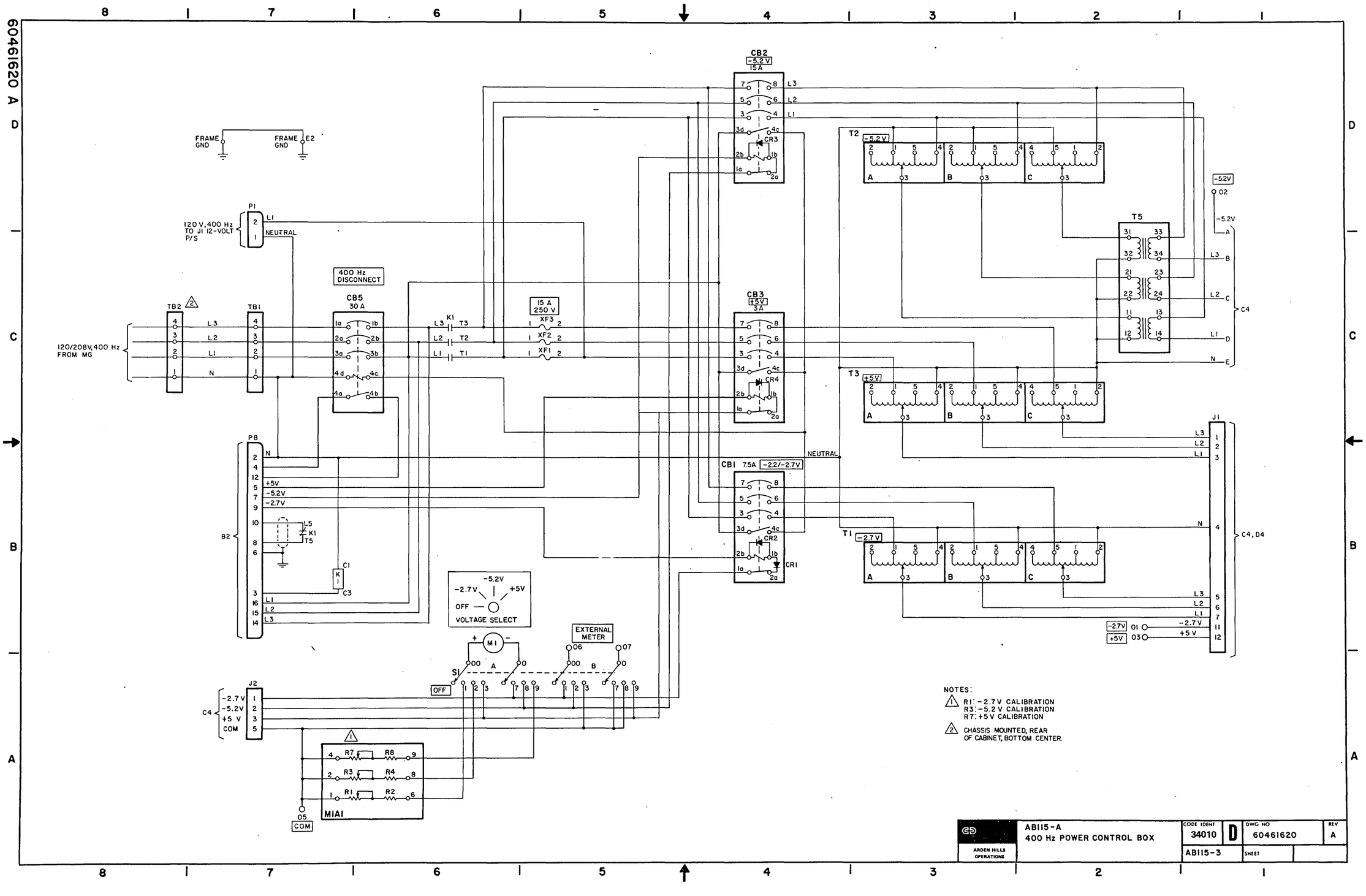

A42 50/60 Hz POWER CONTROL BOX
A44 AIRFLOW SENSOR
71°C (160° F) OPEN ON RISE
A43 AIRFLOW SENSOR
71°C (160°F) OPEN ON RISE
+32V
GND
NEUTRAL
+13V
+5V
-5.2V
-2.7V
BLOWER 1 FAULT
BLOWER 2 FAULT
LOW TEMP FAULT
COND UNIT FAULT
HIGH TEMP FAULT
LOCAL
REMOTE
CONTROL
START
RUN
2 MIN DELAYED SHUTDOWN
2.5 SEC POWER ON LATCH
BLOWER ENABLE
AIRFLOW SENSOR TEST
POWER ON
POWER OFF
400 Hz SENSING
COMPRESSOR FAULT
FAULT-DETECT P/S
BACKUP HIGH TEMP FAULT
HIGH TEMP FAULT
LOW TEMP FAULT
ENV WARNING
LONG WARNING
GROUND
A18 BLOWER ASSY
A22 BLOWER ASSY
120/208 VAC, 50/60 Hz OR 230/380 VAC, 50 Hz OR 240/416 VAC, 50 Hz
MAIN POWER DISCONNECT
A46-A49 SMOKE DETECTORS
HIGH TEMP BACKUP 54.4°C (130°F) CLOSE ON RISE
HIGH TEMP 48.9°C (120°F) OPEN ON RISE
HIGH TEMP WARNING 35°C (95°F) OPEN ON RISE
A41 I/O CONNECTOR PANEL
SHORT WARNING START
SUPERHEAT CONTROL ASSEMBLY
EXPANSION VALVE
LOW TEMP 13.9°C (57°F)
NOTES:
1. CONTROL POWER, PUSH TO RESET.
2. UNLESS OTHERWISE NOTED ALL RESISTORS ARE 1/4 WATT AND ±5% TOLERANCE.
3. THERMOCOUPLES TC1/TC2 USED ONLY FOR MAINTENANCE CHECKS.
4. IOU SHOWN. PROCESSOR AND MEMORY: JUMP P7-1 TO P7-3.
5. IOU SHOWN. PROCESSOR AND MEMORY CONNECTIONS AS FOLLOWS:
P7 PIN | PROC | MEM(BS130-B) | MEM.(BS137-A)
14 | A11-B61 | C04-B17 | B04-A34
13 | A11-C61 | C04-C17 | B04-D34
5 | A11-C45 | C04-C18 | B04-C34
6 | A11-B45 | C04-B18 | B04-B34
6. IOU SHOWN. PROCESSOR: P7-12/16 TO J9-1/2, P7-10/8 TO J10-1/2. MEMORY (BS130-B OR BS137-A): P7-10/16 TO J37-1/2, P7-12/8 TO J38-1/2.
7. PROCESSOR ONLY. J12 REQUIRES 51 Ω TERM.
8. CHASSIS-MOUNTED, REAR OF CABINET, BOTTOM CENTER.
9. VENDOR-SUPPLIED; SEE VENDOR DOCUMENTATION.
ARDEN HILLS OPERATIONS
AB115-A
50/60 Hz POWER CONTROL BOX
CODE IDENT 34010
D
DWG NO 60461620
REV A
AB115-2
SHEET

AB115-A 400-Hz Power Control Box

The MG sends 120/208-V ac, 400-Hz to the AB115-A 400-Hz PCB (AB115-3). This voltage passes through CB5 and K1 contacts and through CB1, CB2, and CB3 to variacs T1 through T4 which control the input voltage levels to the logic power supplies and therefore the logic voltage levels. The outputs of these variacs are approximately 115-V ac. T2 controls the input voltage to buck-boost transformer T5, which provides the extra current required by the -5.2-V power supply.

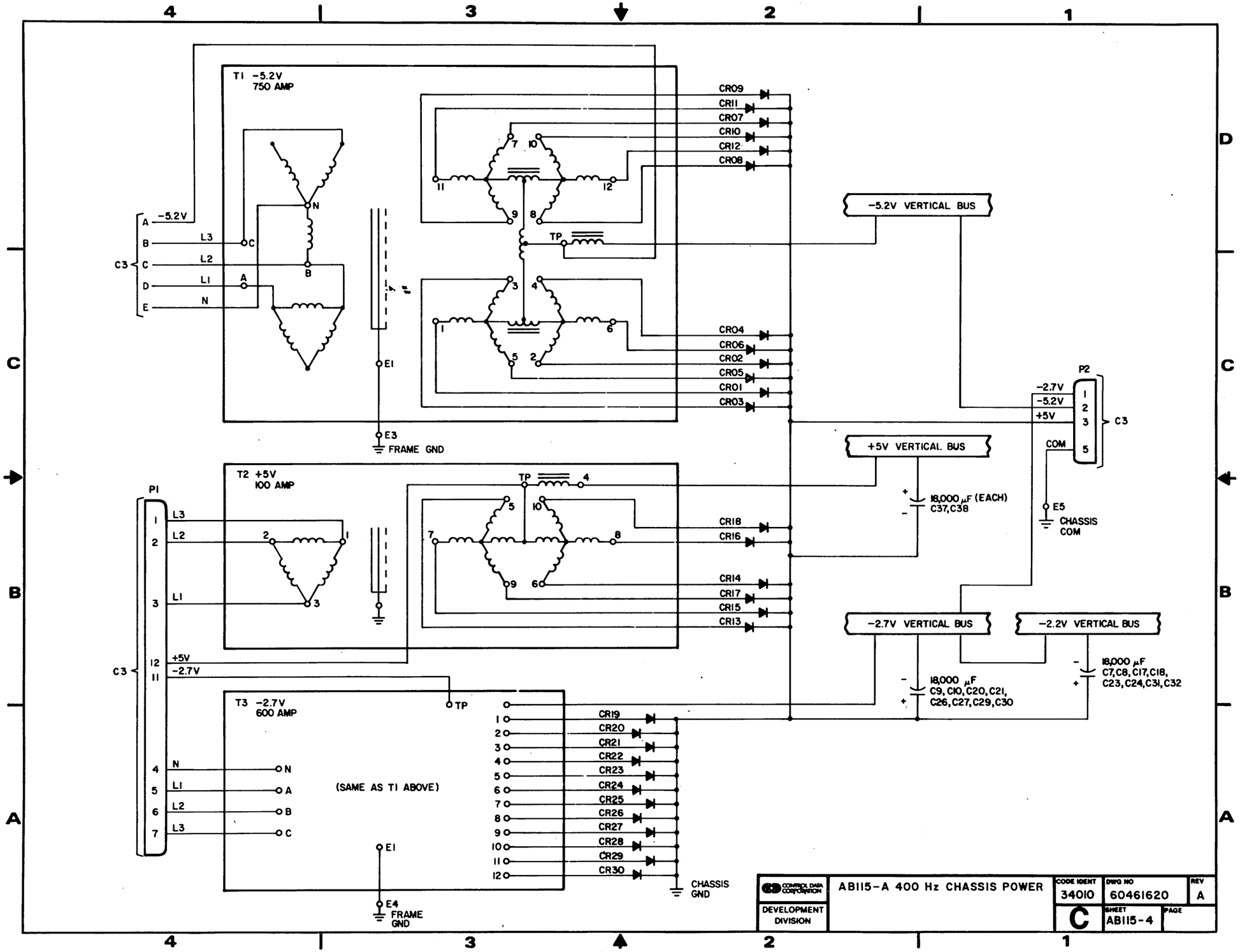
The outputs of the logic power supplies return to the 400-Hz PCB via J2 for display at the VOLTAGE SELECT panel meter (M1). R1, R3, and R7 control meter current for the selected voltages; they are used to calibrate the meter to display percent deviation from nominal voltage.

Just after CB5, the three 400-Hz phases go to the 50/60-Hz PCB via P8. This allows the fault detection logic in the 50/60-Hz PCB to monitor the presence of 400-Hz power at the 400-Hz PCB and to control K1, which applies 400-Hz to the variacs.


FRAME GND
FRAME GND
E2
P1
120 V, 400 Hz TO J1 12-VOLT P/S
L1
NEUTRAL
400 Hz DISCONNECT
CB5
30 A
TB2
TB1
120/208V, 400 Hz FROM MG
L3
L2
L1
N
K1
T3
T2
T1
15 A 250 V
XF3
XF2
XF1
CB2
-5.2V
15 A
CR3
CB3
+5V
3 A
CR4
CB1 7.5A -2.2/-2.7V
CR2
CR1
T2
T3
T1
T5
C4
J1
C4, D4
P8
+5V
-5.2V
-2.7V
B2
L5
K1
T5
C1
C3
-5.2V
-2.7V
+5V
OFF
VOLTAGE SELECT
EXTERNAL METER
M1
S1
J2
C4
-2.7V
-5.2V
+5 V
COM
R7
R8
R3
R4
R1
R2
M1A1
O5
COM
NOTES:
1. R1: -2.7 V CALIBRATION
R3: -5.2 V CALIBRATION
R7: +5 V CALIBRATION
2. CHASSIS MOUNTED, REAR OF CABINET, BOTTOM CENTER.
ARDEN HILLS OPERATIONS
AB115-A
400 Hz POWER CONTROL BOX
CODE IDENT 34010
D
DWG NO 60461620
REV A
AB115-3
SHEET

AB115-A 400-Hz Chassis Power

The 115-V ac outputs of the 400-Hz PCB variacs go to chassis-mounted stepdown transformers. These transformers reduce the variac voltages and double or quadruple the number of phases. After rectification by CR1 through CR30, the output phases add through balance windings and a choke filter to produce a dc voltage with 2 percent or less ripple. Refer to the AB115-A 400-Hz Chassis Power diagram (AB115-4).


T1 -5.2V
750 AMP
CR09
CR11
CR07
CR10
CR12
CR08
-5.2V VERTICAL BUS
TP
CR04
CR06
CR02
CR05
CR01
CR03
E1
E3
FRAME GND
P2
-2.7V
-5.2V
+5V
COM
C3
+5V VERTICAL BUS
18,000 μF (EACH)
C37,C38
E5
CHASSIS
COM
T2 +5V
100 AMP
P1
L3
L2
L1
N
CR18
CR16
CR14
CR17
CR15
CR13
-2.7V VERTICAL BUS
-2.2V VERTICAL BUS
18,000 μF
C9, C10, C20, C21,
C26, C27, C29, C30
18,000 μF
C7, C8, C17, C18,
C23, C24, C31, C32
T3 -2.7V
600 AMP
(SAME AS T1 ABOVE)
CR19
CR20
CR21
CR22
CR23
CR24
CR25
CR26
CR27
CR28
CR29
CR30
CHASSIS
GND
E4
FRAME
GND
CONTROL DATA CORPORATION
DEVELOPMENT DIVISION
AB115-A 400 Hz CHASSIS POWER
CODE IDENT 34010
DWG NO 60461620
REV A
SIZE C
SHEET AB115-4
PAGE

BS174-A/BS175-A CENTRAL MEMORY 400-HZ POWER DISTRIBUTION †

The MG supplies 400-Hz power to the 400-Hz power-control box. When no faults exist, 400-Hz power transfers directly to the 400-Hz power-control box (PCB) to the -2.2 V power supply and through the -4.7 V adjust panel assembly to the -4.7 V power supply. The -2.2 V and -4.7 V bus bars distribute logic voltage to the logic modules in all memory cages. For related diagrams refer to BS174/5-1 through BS174/5-9.

The 400-Hz PCB interrupts 400-Hz power and removes -2.2 V and -4.7 V power from the logic modules when CB1 or K1/K2 open. CB1 opens if the primary and back-up high temperature thermistors fail to detect the high temperature condition and memory cabinet outlet water temperature rises to 39.4 °C (103 °F). The normally-open contacts in the high temperature (outlet water) thermostat close to trip CB1 which removes all 400-Hz power from the cabinet. No LED fault indicators light. K1 and K2 open simultaneously when any primary fault condition occurs.

The -4.7 V (CB1) and -2.2 V (CB2) protect circuits open when any back-up fault condition occurs. The -4.7 V (K1) and -2.2 V (K2) control circuits open simultaneously only when an overvoltage/overcurrent fault occurs. Fault conditions are discussed in further detail in subsequent paragraphs.

BS174-A/BS175-A Power Control Assembly

The power-control assembly consists of the power-control module (BS174/5-10 through BS174/5-13) and power-control indicator (BS174/5-14 and BS174/5-15). The power-control indicator enables local (LCL) control of cabinet power and displays all cabinet faults and status. The power-control module monitors logic power supply circuit breaker status and protection cable continuity status. It reacts to fault signals received from the TCVP assembly and low temperature sensor assemblies. Upon receiving a fault, the power-control module removes power from all memory cages.

Faults are received on redundant channels; primary and back-up. The -12 V primary channel deenergizes the -2.2 V/-4.7 V control relays in the 400-Hz PCB, while the +12-V back-up channel trips the individual power supply protect circuit breakers.

BS174-A/BS175-A Temperature, Current, and Voltage Protection Assembly

Each memory cage contains a TCVP assembly (BS174/5-16 through BS174/5-18). The TCVP assembly functions in conjunction with a -4.7 V adjust panel assembly, the power-control assembly, and the -2.2 V protect circuit breaker (located in the 400-Hz PCB) to provide overcurrent/overvoltage protection and high temperature-protection. Each TCVP assembly also provides a visual display of the fault condition.

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† For information on which systems use the BS174-A/BS175-A, refer to Basic System Configuration in General Description, section 1.

BS174-A/BS175-A Fault Warnings and Shutdowns

All memory cabinet faults are displayed on the power-control indicator. Once a fault is detected, the LED fault indicator lights, and the power-control module determines the appropriate delay time before removing power. When shutdown occurs, any fault(s) that is present is latched on. After the fault(s) is cleared, the fault LEDs remain lit until manually reset by the RESET/RESTART push-button switch on the power-control indicator.

BS174-A/BS175-A Overvoltage/Overcurrent Fault

Overvoltage/overcurrent fault conditions detected by the TCVP assembly cause the following to occur:

- The TCVP assembly senses the overvoltage/overcurrent fault, lights the related LED fault indicator, and sends a fault signal to the power-control assembly.
- The power-control assembly sends an Overvoltage/Overcurrent Fault Shutdown signal to the silicon-controlled rectifiers (SCRs) which shunt voltage to ground. The SCRs are connected to the output of each logic power supply.
- The power-control assembly sends a Memory Fault I/II signal to the SPM (via the remote metering assembly) which initiates a 137.5-second delayed shutdown sequence.
- Control relays (in the 400-Hz PCB) and the -4.7 V adjust panel assembly energize to open normally-closed contactors at the input to the logic power supplies.
- The -2.2 V and -4.7 V protect circuit breakers trip to remove power from the logic power supplies.
- The power-control indicator lights the appropriate LED fault indicators.

BS174-A/BS175-A High Temperature Fault (Primary and Back-up)

Primary high temperature faults detected by eight primary thermistors (per cage) cause the following to occur:

- The thermistor which senses the high temperature condition (32 ^{o}C to 34 ^{o}C; 89.6 ^{o}F to 93.2 ^{o}F) sends a signal to the TCVP assembly.
- The appropriate LED on a TCVP assembly lights to indicate which of the eight primary high temperature thermistors sensed the high temperature condition.
- The TCVP assembly sends the primary high temperature fault signal to the power-control assembly. The power-control assembly starts the 9$\pm$2-second primary high temperature fault delay, sends the Memory I/II Fault signal to the SPM, and lights the primary high temperature (PRI HI TEMP FAULT) LED fault indicator on the power-control indicator.
- After the primary high temperature fault delay times-out (9$\pm$2-second), the TCVP assembly latches the primary high temperature fault.
- The -2.2 V/-4.7 V control relays (K1 and K2 in the 400-Hz power-control box) energize to open the normally-closed contacts at the input to the -2.2 V and -4.7 V protect circuits; power is removed from the logic power supplies. The -2.2 V and -4.7 V protect circuit breakers do not trip.

Back-up high temperature faults detected by the eight back-up thermistors (per cage) cause the following to occur:

- The thermistor which senses the high temperature condition (38 °C to 41 °C; 100.4 °F to 105.6 °F) sends a signal to the TCVP assembly.
- The appropriate LED on a TCVP assembly lights to indicate which of the eight back-up high temperature thermistors sensed the high temperature condition.
- The TCVP assembly sends the Back-up High Temperature Fault signal to the power-control assembly. The power-control assembly starts the 2.5-second back-up high temperature delay, sends a Memory I/II Fault signal to the TMPC, and lights the back-up high temperature (BACKUP HI TEMP FAULT) LED fault indicator on the power-control indicator.
- After the back-up high temperature fault delay times-out (2.5 second), the TCVP assembly latches the back-up high temperature fault.
- The -2.2 V and -4.7 V protect circuit breakers trip to remove power from the logic power supplies.

BS174-A/BS175-A High Temperature Fault (Outlet Water Thermostat)

If the primary and back-up high temperature-protection circuits fail and memory cabinet outlet water temperature rises to 39.5 °C (103 °F), the following occurs:

- The normally-open contacts in the outlet water thermostat close.
- The 400-Hz MASTER circuit breaker in the 400-Hz PCB trips to remove all cabinet power.

NOTE

No fault signal is sent to the SPM and no LED fault indicators light. To determine if a high temperature fault exists, measure the outlet water thermostat terminals for continuity.

BS174-A/BS175-A Low Temperature Fault (Primary)

Primary low temperature faults are sensed by the inlet water temperature sensor assembly. When memory cabinet inlet water temperature drops to 14 °C ± 1.2 °C (57.2 °F), the inlet water temperature sensor assembly sends a signal to the power-control assembly and the following occurs:

- The power-control assembly starts the 65±7-second primary low temperature fault delay, sends the Memory I/II Fault signal to the SPM, and lights the primary low temperature (PRI LO TEMP FAULT) LED fault indicator on the power-control indicator.
- After the primary low temperature fault delay times-out (65±7 second), the -2.2 V/-4.7 V control relay (K1 and K2 in the 400-Hz power-control box) energize to open the normally-closed contacts at the input to the -2.2 V and -4.7 V protect circuits.
- The -2.2 V and -4.7 V protect circuit breakers trip to remove power from the logic power supplies.

BS174-A/BS175-A Low Temperature Fault (Back-up)

Back-up low temperature faults are sensed by the cabinet dewpoint sensor assembly attached to the cabinet inlet water pipe. When cabinet inlet water cools below the cabinet dewpoint temperature, the cabinet dewpoint sensor assembly sends a signal to the power-control assembly, and the following occurs:

- The power-control assembly starts the 180±20-second back-up low temperature fault delay, sends the Memory I/II Fault signal to the SPM, and lights the back-up low temperature (BACK-UP LO TEMP FAULT) LED fault indicator on the power-control indicator.
- After the back-up low temperature fault delay times-out (180±20-second), the -2.2 V/-4.7 V control relays (in the 400-Hz PCB) energize to open the normally-closed contacts at the input to the -2.2 V and -4.7 V protect circuits.
- The -2.2 V and -4.7 V protect circuit breakers trip to remove power from the logic power supplies.

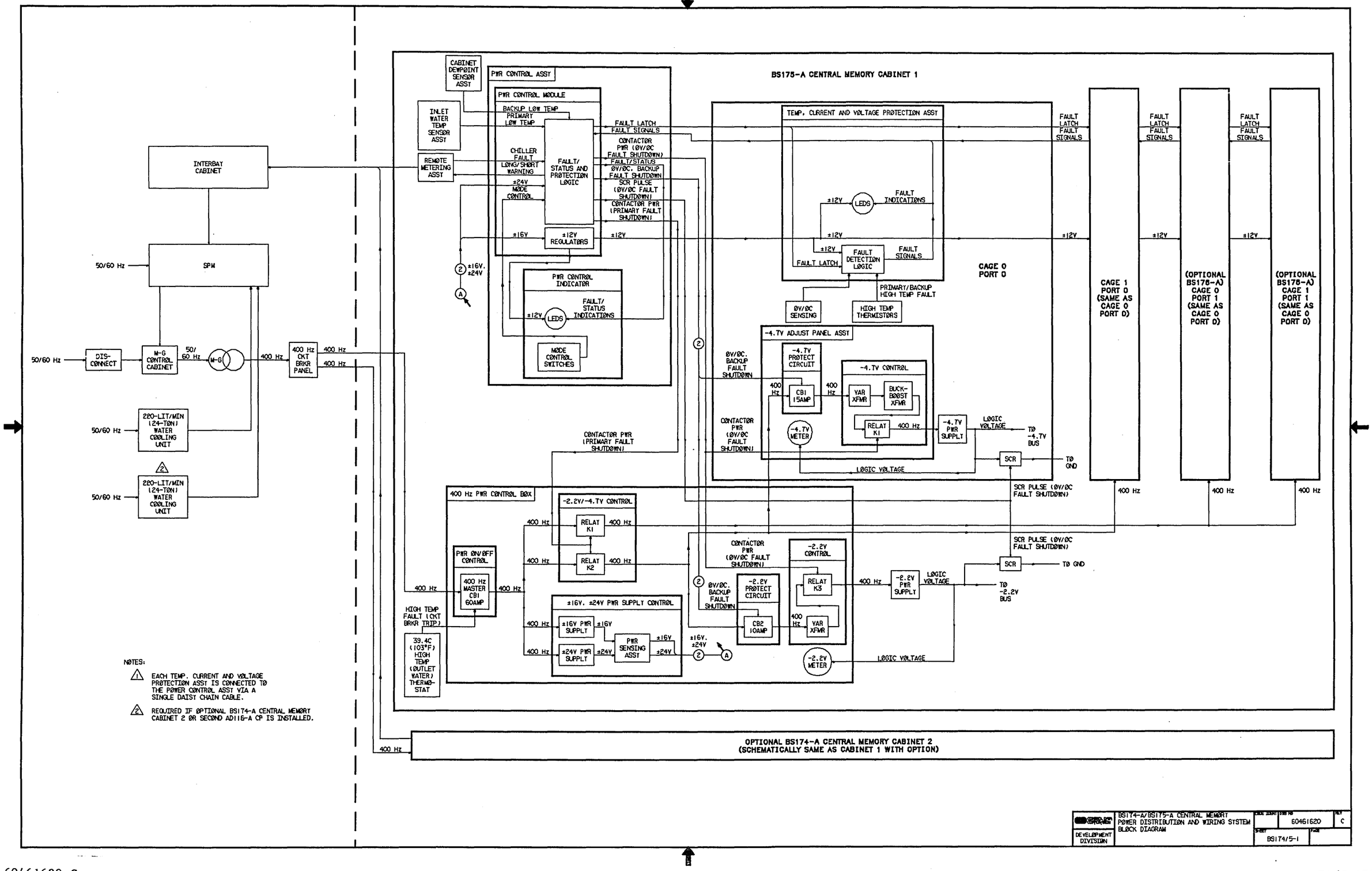
BS174-A/BS175-A Cable Fault

The power-control assembly senses the continuity of the cables which interconnect all the protection sensing and power shutdown devices located throughout the memory cabinet. When any protection cable is disconnected, the following occurs:

- The cable fault (CA FAULT) LED fault indicator lights on the power-control indicator.
- The power-control assembly sends the Memory I/II Fault signal to the wall box.
- The -2.2 V/-4.7 V control relay (K1 and K2 in the 400-Hz PCB) energize to open the normally-closed contacts at the input to the -2.2 V and -4.7 V protect circuits.
- The -2.2 V and -4.7 V protect circuit breakers trip to remove power from the logic power supplies.
- The power-control indicator lights the appropriate LED fault indicators.

BS174-A/BS175-A Cooling Unit Fault (Chiller Fault)

The cooling unit fault sensing circuit is not used and is disabled at the remote metering assembly.

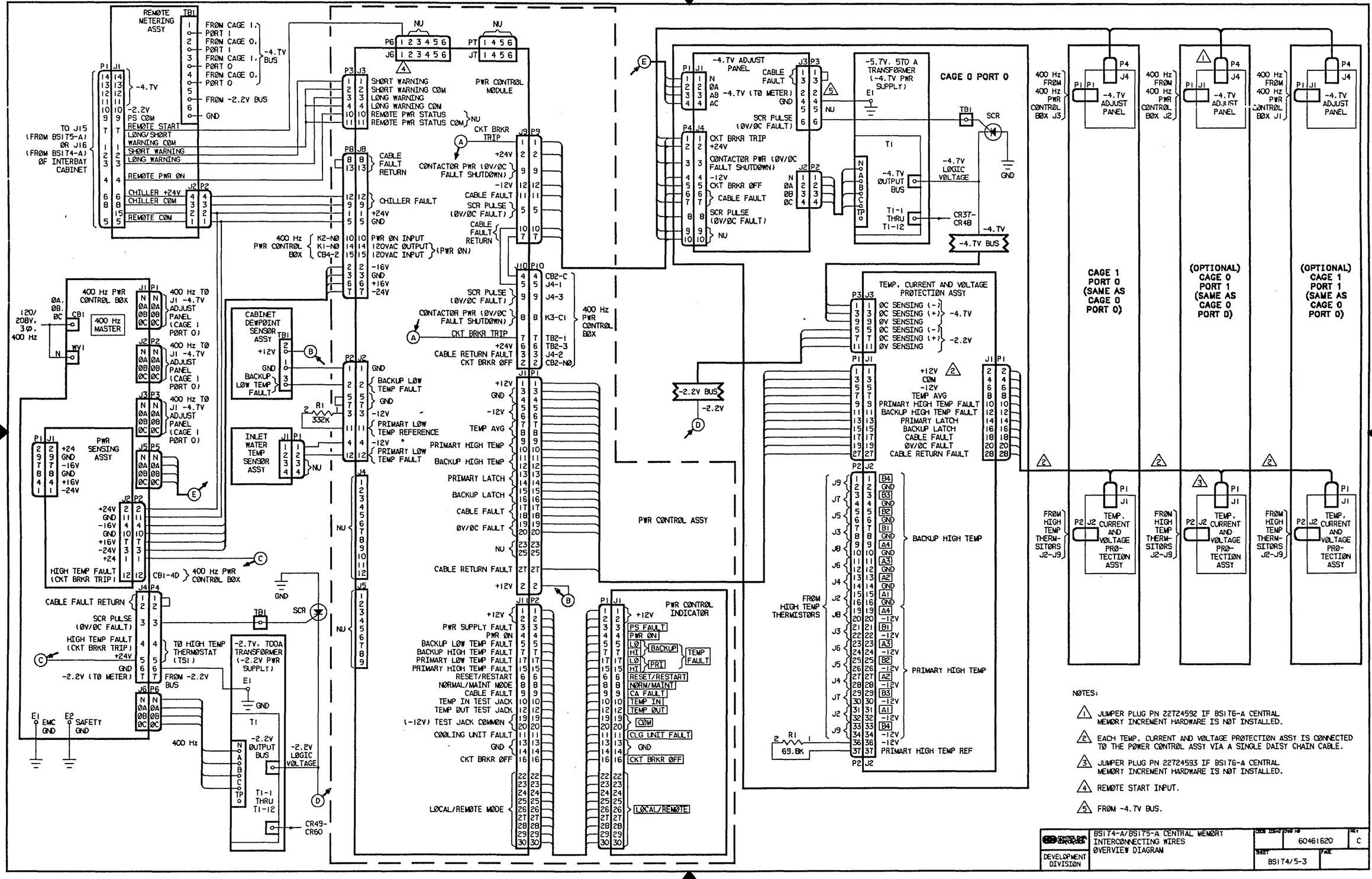


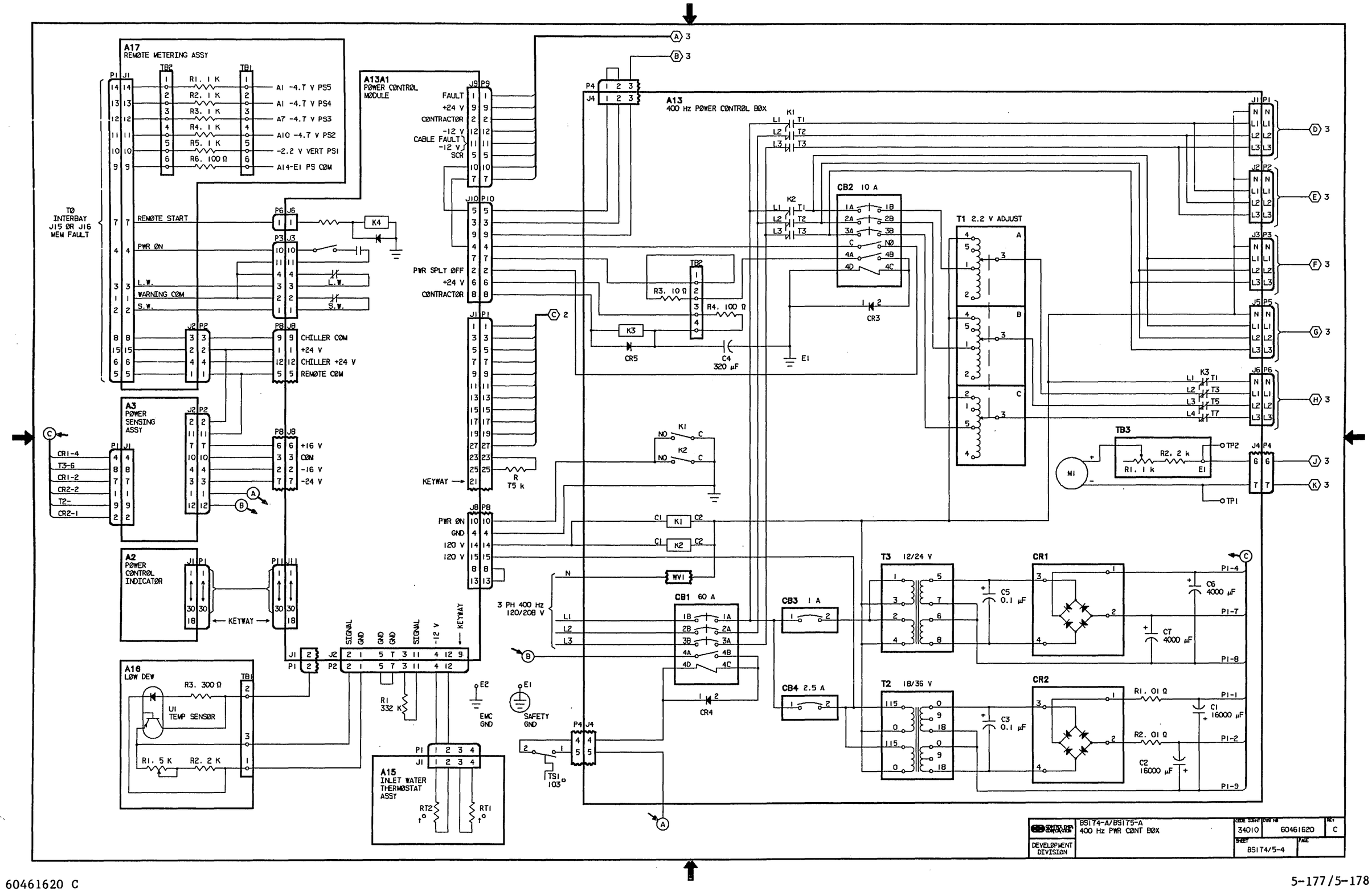
NOTES:

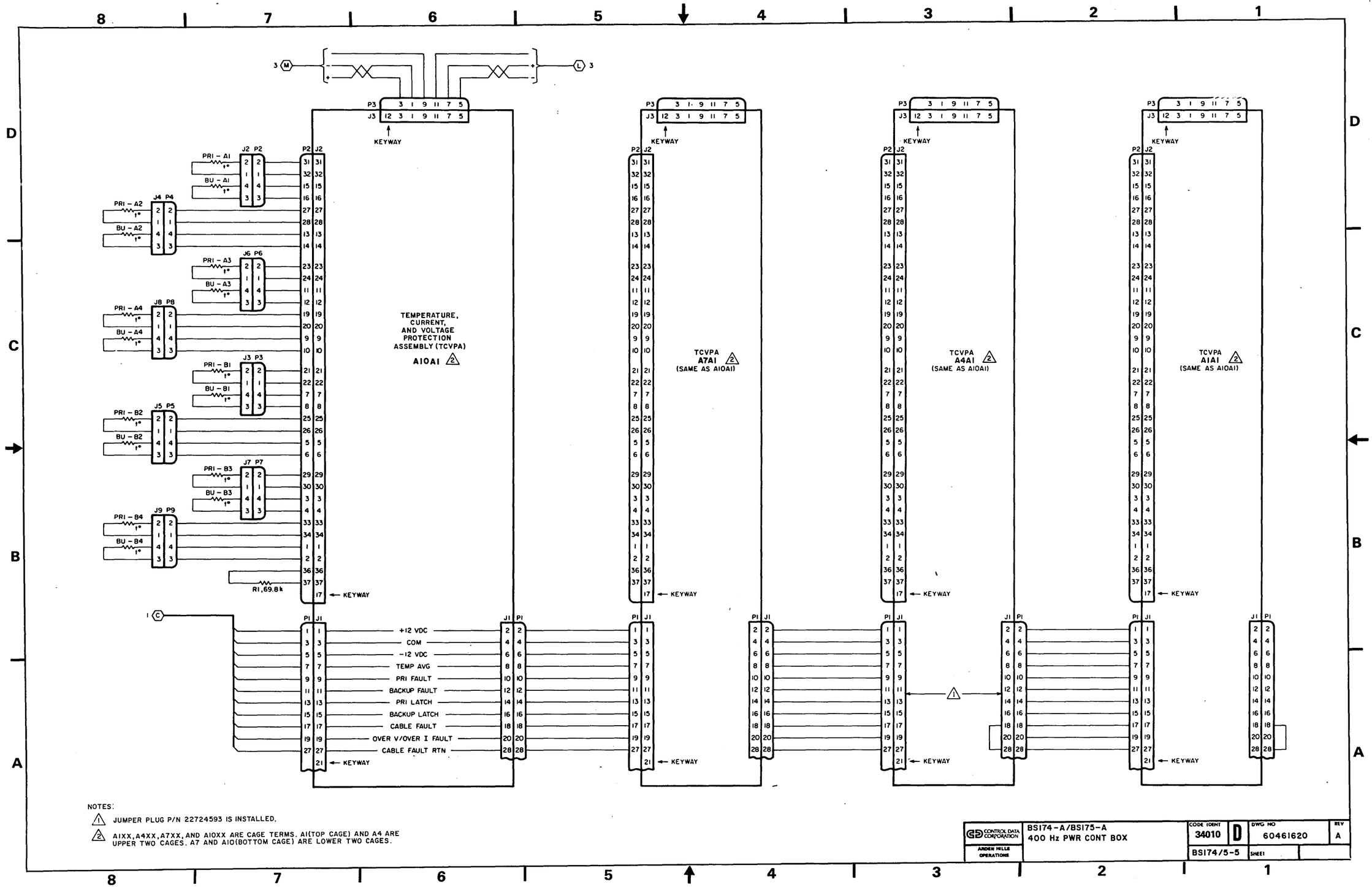
1. EACH TEMP, CURRENT AND VOLTAGE PROTECTION ASSY IS CONNECTED TO THE POWER CONTROL ASSY VIA A SINGLE DAISY CHAIN CABLE.
2. REQUIRED IF OPTIONAL BS174-A CENTRAL MEMORY CABINET 2 OR SECOND AD11G-A CP IS INSTALLED.

DEVELOPMENT DIVISION	BS174-A/BS175-A CENTRAL MEMORY POWER DISTRIBUTION AND WIRING SYSTEM BLOCK DIAGRAM	60461620	C
		SHEET BS174/5-1	

SHEET BS174/5-2 HAS BEEN DELETED.


REMØTE METERING ASSY
TB1
FRØM CAGE 1, PØRT 1
FRØM CAGE 0, PØRT 1
FRØM CAGE 1, PØRT 0
FRØM CAGE 0, PØRT 0
FRØM -2.2V BUS
GND
-4.7V BUS
TO J15 (FRØM BSI75-A) ØR J16 (FRØM BSI74-A) ØF INTERBAY CABINET
-4.7V
-2.2V
PS CØM
REMØTE START
LØNG/SHØRT WARNING CØM
SHØRT WARNING
LØNG WARNING
REMØTE PWR ØN
CHILLER +24V
CHILLER CØM
REMØTE CØM
PWR CØNTRØL MØDULE
SHØRT WARNING
SHØRT WARNING CØM
LØNG WARNING
LØNG WARNING CØM
REMØTE PWR STATUS
REMØTE PWR STATUS CØM
NU
CKT BRKR TRIP
+24V
CØNTACTØR PWR (ØV/ØC FAULT SHUTDØWN)
-12V
CABLE FAULT
SCR PULSE (ØV/ØC FAULT)
CABLE FAULT RETURN
CHILLER FAULT
PWR ØN INPUT
120VAC ØUTPUT
120VAC INPUT
400 Hz PWR CØNTRØL BØX
K2-NØ
K1-NØ
CB4-2
(PWR ØN)
-16V
GND
+16V
-24V
400 Hz PWR CØNTRØL BØX
120/ 208V, 3Ø, 400 Hz
ØA, ØB, ØC
CB1
400 Hz MASTER
MV1
400 Hz TØ J1 -4.7V ADJUST PANEL (CAGE 1 PØRT 0)
PWR SENSING ASSY
+24
GND
-16V
GND
+16V
-24V
HIGH TEMP FAULT (CKT BRKR TRIP)
CBI-4D
400 Hz PWR CØNTRØL BØX
CABINET DEWPØINT SENSØR ASSY
+12V
GND
BACKUP LØW TEMP FAULT
INLET WATER TEMP SENSØR ASSY
R1
332K
BACKUP LØW TEMP FAULT
GND
PRIMARY LØW TEMP REFERENCE
-12V
PRIMARY LØW TEMP FAULT
TEMP AVG
PRIMARY HIGH TEMP
BACKUP HIGH TEMP
PRIMARY LATCH
BACKUP LATCH
CABLE FAULT
ØV/ØC FAULT
CABLE RETURN FAULT
PWR CØNTRØL ASSY
CB2-C
J4-1
J4-3
K3-C1
CB2-N2
TB2-1
TB2-3
J4-2
CB2-NØ
400 Hz PWR CØNTRØL BØX
CABLE RETURN FAULT
CKT BRKR ØFF
SCR PULSE (ØV/ØC FAULT)
CØNTACTØR PWR (ØV/ØC FAULT SHUTDØWN)
CKT BRKR TRIP
+24V
CABLE RETURN FAULT
CKT BRKR ØFF
SCR
TBI
TØ HIGH TEMP THERMØSTAT (TSI)
FRØM -2.2V BUS
-2.7V, TOØA TRANSFØRMER (-2.2V PWR SUPPLY)
EI
GND
TI
-2.2V ØUTPUT BUS
-2.2V LØGIC VØLTAGE
TI-1 THRU TI-12
CR49-CR60
400 Hz
E1 EMC GND
E2 SAFETY GND
PWR ØN INDICATØR
+12V
PS FAULT
PWR ØN
LØ
HI
BACKUP
TEMP FAULT
LØ
HI
PRI
RESET/RESTART
NØRM/MAINT
CA FAULT
TEMP IN
TEMP ØUT
CØM
CLG UNIT FAULT
GND
CKT BRKR ØFF
LØCAL/REMØTE
PWR SUPPLY FAULT
BACKUP LØW TEMP FAULT
BACKUP HIGH TEMP FAULT
PRIMARY LØW TEMP FAULT
PRIMARY HIGH TEMP FAULT
RESET/RESTART
NØRMAL/MAINT MØDE
CABLE FAULT
TEMP IN TEST JACK
TEMP ØUT TEST JACK
(-12V) TEST JACK CØMMØN
CØØLING UNIT FAULT
GND
CKT BRKR ØFF
LØCAL/REMØTE MØDE
-4.7V ADJUST PANEL
CABLE FAULT
SCR PULSE (ØV/ØC FAULT)
CKT BRKR TRIP
+24V
CØNTACTØR PWR (ØV/ØC FAULT SHUTDØWN)
-12V
CKT BRKR ØFF
CABLE FAULT
SCR PULSE (ØV/ØC FAULT)
N
ØA
AB
AC
GND
-4.7V (TØ METER)
-5.7V, 57Ø A TRANSFØRMER (-4.7V PWR SUPPLY)
EI
TI
-4.7V ØUTPUT BUS
TI-1 THRU TI-12
SCR
GND
-4.7V LØGIC VØLTAGE
CR37-CR48
-4.7V
-4.7V BUS
-2.2V BUS
-2.2V
CAGE 0 PORT 0
TEMP, CURRENT AND VØLTAGE PRØTECTIØN ASSY
ØC SENSING (-)
ØC SENSING (+)
ØV SENSING
ØC SENSING (-)
ØC SENSING (+)
ØV SENSING
-4.7V
-2.2V
+12V
CØM
-12V
TEMP AVG
PRIMARY HIGH TEMP FAULT
BACKUP HIGH TEMP FAULT
PRIMARY LATCH
CABLE FAULT
ØV/ØC FAULT
CABLE RETURN FAULT
FRØM HIGH TEMP THERMISTØRS
R1
69.8K
PRIMARY HIGH TEMP REF
BACKUP HIGH TEMP
PRIMARY HIGH TEMP
400 Hz FRØM 400 Hz PWR CØNTRØL BØX J3
400 Hz FRØM 400 Hz PWR CØNTRØL BØX J2
400 Hz FRØM 400 Hz PWR CØNTRØL BØX J1
-4.7V ADJUST PANEL
CAGE 1 PORT 0 (SAME AS CAGE 0 PORT 0)
(OPTIONAL) CAGE 0 PORT 1 (SAME AS CAGE 0 PORT 0)
(OPTIONAL) CAGE 1 PORT 1 (SAME AS CAGE 0 PORT 0)
FRØM HIGH TEMP THERMISTØRS J2-J9
TEMP, CURRENT AND VØLTAGE PRØTECTIØN ASSY
NØTES:
1. JUMPER PLUG PN 22T24592 IF BSI76-A CENTRAL MEMØRY INCREMENT HARDWARE IS NØT INSTALLED.
2. EACH TEMP, CURRENT AND VØLTAGE PRØTECTIØN ASSY IS CØNNECTED TØ THE PØWER CØNTRØL ASSY VIA A SINGLE DAISY CHAIN CABLE.
3. JUMPER PLUG PN 22T24593 IF BSI76-A CENTRAL MEMØRY INCREMENT HARDWARE IS NØT INSTALLED.
4. REMØTE START INPUT.
5. FRØM -4.7V BUS.
DEVELØPMENT DIVISION
BSIT4-A/BSI75-A CENTRAL MEMØRY INTERCØNNECTING WIRES ØVERVIEW DIAGRAM
60461620
C
BSIT4/5-3


A17
REMØTE METERING ASSY
TB2
TB1
R1. 1 K
R2. 1 K
R3. 1 K
R4. 1 K
R5. 1 K
R6. 100 Ω
A1 -4.7 V PS5
A1 -4.7 V PS4
A7 -4.7 V PS3
A10 -4.7 V PS2
-2.2 V VERT PSI
A14-E1 PS CØM
TØ INTERBAY J15 ØR J16 MEM FAULT
REMØTE START
PWR ØN
L.W.
WARNING CØM
S.W.
CHILLER CØM
+24 V
CHILLER +24 V
REMØTE CØM
K4
A13A1
PØWER CØNTRØL MØDULE
FAULT
+24 V
CØNTRACTØR
-12 V
CABLE FAULT
-12 V SCR
PWR SPLY ØFF
+24 V
CØNTRACTØR
KEYWAY
R 75 k
A13
400 Hz PØWER CØNTRØL BØX
K1
K2
K3
CB2 10 A
T1 2.2 V ADJUST
R3. 10 Ω
R4. 100 Ω
CR3
CR5
C4 320 μF
E1
A3
PØWER SENSING ASSY
CR1-4
T3-6
CR1-2
CR2-2
T2-
CR2-1
+16 V
CØM
-16 V
-24 V
PWR ØN
GND
120 V
120 V
WV1
CB1 60 A
CB3 1 A
CB4 2.5 A
CR4
3 PH 400 Hz 120/208 V
L1
L2
L3
N
T3 12/24 V
T2 18/36 V
CR1
CR2
C5 0.1 μF
C3 0.1 μF
C6 4000 μF
C7 4000 μF
C1 16000 μF
C2 16000 μF
R1. 01 Ω
R2. 01 Ω
TB3
R2. 2 k
R1. 1 k
TP2
TP1
M1
A2
PØWER CØNTRØL INDICATØR
KEYWAY
A16
LØW DEW
R3. 300 Ω
U1 TEMP SENSØR
R1. 5 K
R2. 2 K
R1 332 K
EMC GND
SAFETY GND
TS1 103°
A15
INLET WATER THERMØSTAT ASSY
RT2
RT1
SIGNAL
GND
-12 V
KEYWAY
BSI74-A/BSI75-A
400 Hz PWR CØNT BØX
34010
60461620
C
BSI74/5-4

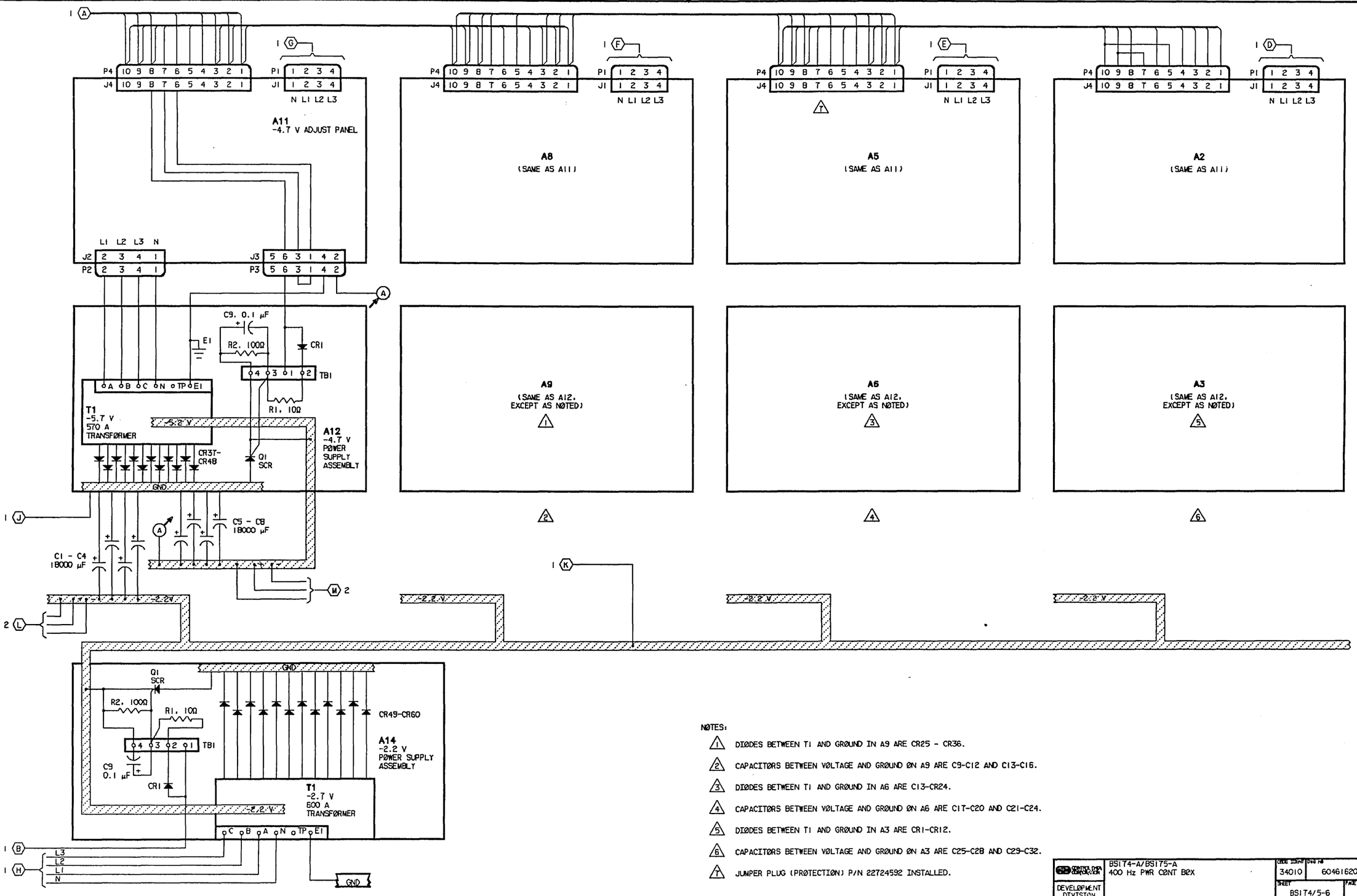


NOTES:

(1) JUMPER PLUG P/N 22724593 IS INSTALLED.

(2) A1XX, A4XX, A7XX, AND A10XX ARE CAGE TERMS. A1(TOP CAGE) AND A4 ARE UPPER TWO CAGES. A7 AND A10(BOTTOM CAGE) ARE LOWER TWO CAGES.

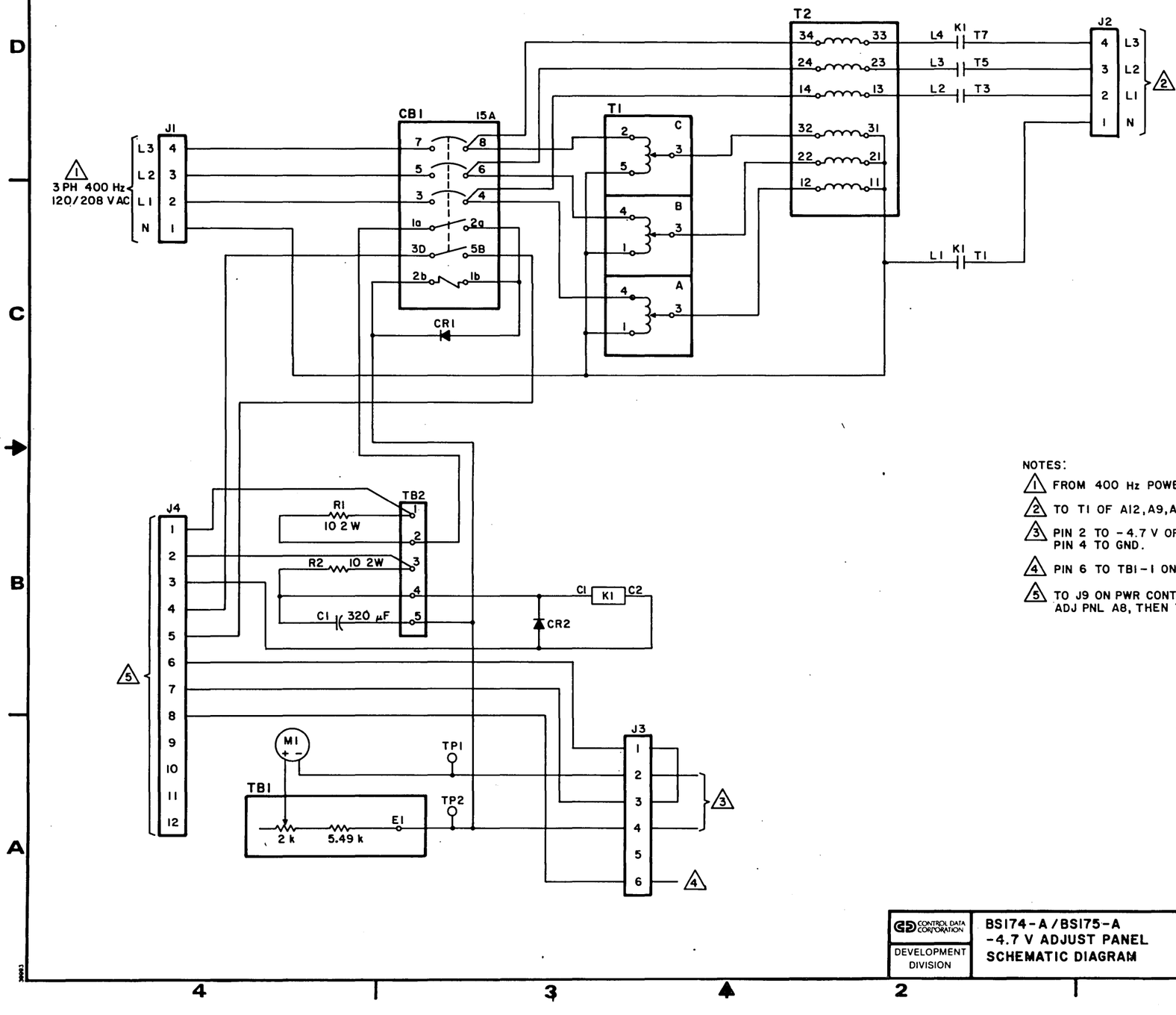
CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BS174-A/BS175-A 400 Hz PWR CONT BOX	CODE IDENT 34010	D	DWG NO 60461620 REV A
		BS174/5-5	SHEET	



NOTES:

1. DIODES BETWEEN T1 AND GROUND IN A9 ARE CR25 - CR36.
2. CAPACITORS BETWEEN VOLTAGE AND GROUND ON A9 ARE C9-C12 AND C13-C16.
3. DIODES BETWEEN T1 AND GROUND IN A6 ARE C13-CR24.
4. CAPACITORS BETWEEN VOLTAGE AND GROUND ON A6 ARE C17-C20 AND C21-C24.
5. DIODES BETWEEN T1 AND GROUND IN A3 ARE CR1-CR12.
6. CAPACITORS BETWEEN VOLTAGE AND GROUND ON A3 ARE C25-C28 AND C29-C32.
7. JUMPER PLUG (PROTECTION) P/N 22724592 INSTALLED.

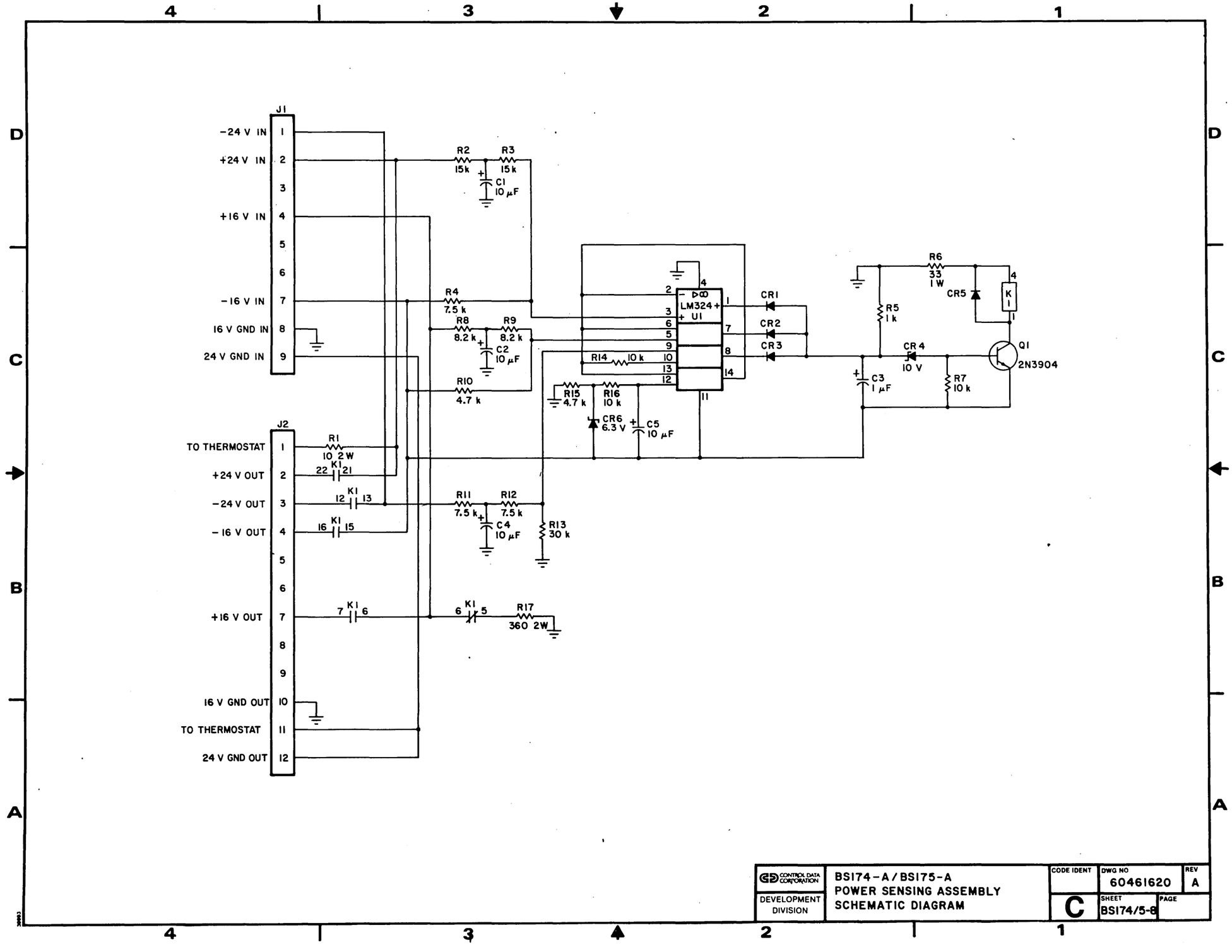
CONTROL DATA CORPORATION	BS174-A/BS175-A 400 Hz PWR CONT BOX	CODE IDENT 34010	DWG NO 60461620 REV C
DEVELOPMENT DIVISION		SHEET BS174/5-6	PAGE



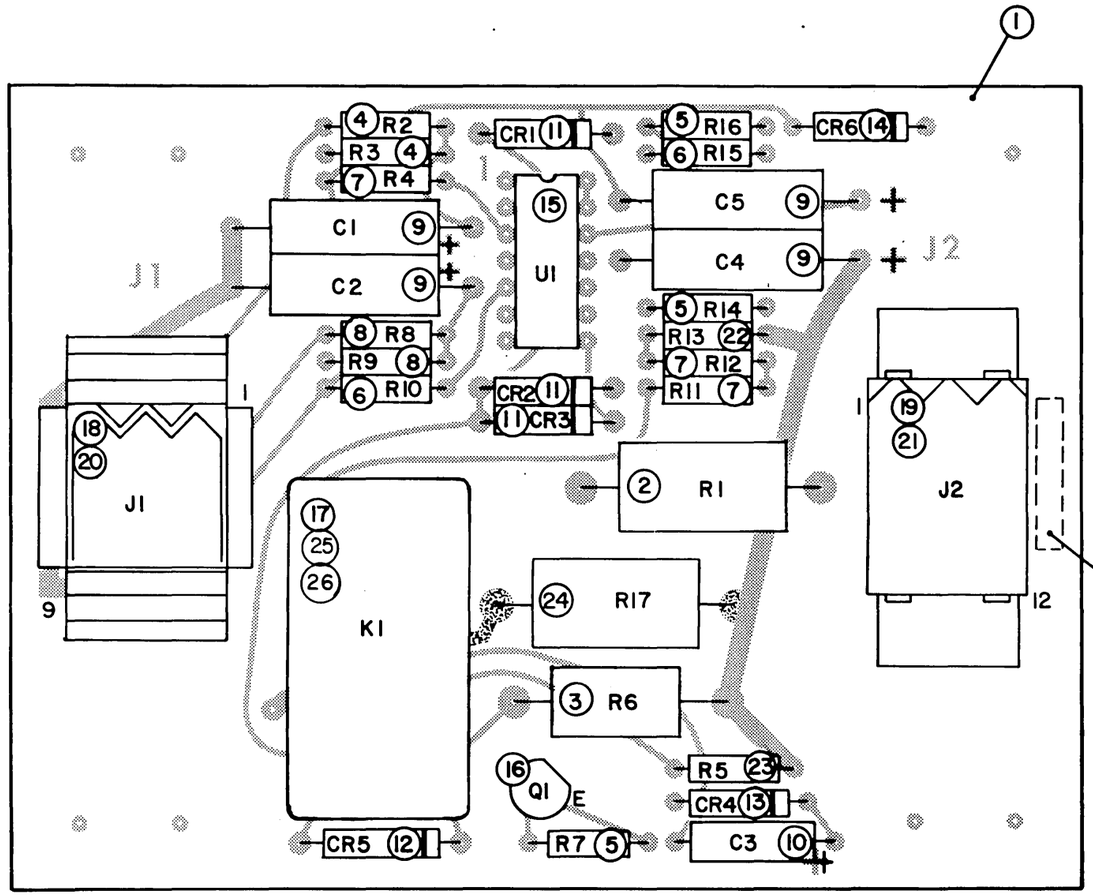
NOTES:

1. FROM 400 Hz POWER CONTROL BOX J1, J2, J3, J5 (A13).
2. TO T1 OF A12, A9, A6, OR A3.
3. PIN 2 TO -4.7 V OR -5.2 V BUS ON BACK PANEL. PIN 4 TO GND.
4. PIN 6 TO TB1-1 ON A12, A9, A6 OR A3
5. TO J9 ON PWR CONT MODULE (A13A1). TO J4 ON -4.7 V/-5.2 V ADJ PNL A8, THEN TO A5, AND THEN TO A2.

CONTROL DATA CORPORATION DEVELOPMENT DIVISION	BS174-A/BS175-A -4.7 V ADJUST PANEL SCHEMATIC DIAGRAM	CODE IDENT C	DWG NO 60461620	REV A
			SHEET BS174/5-7	PAGE



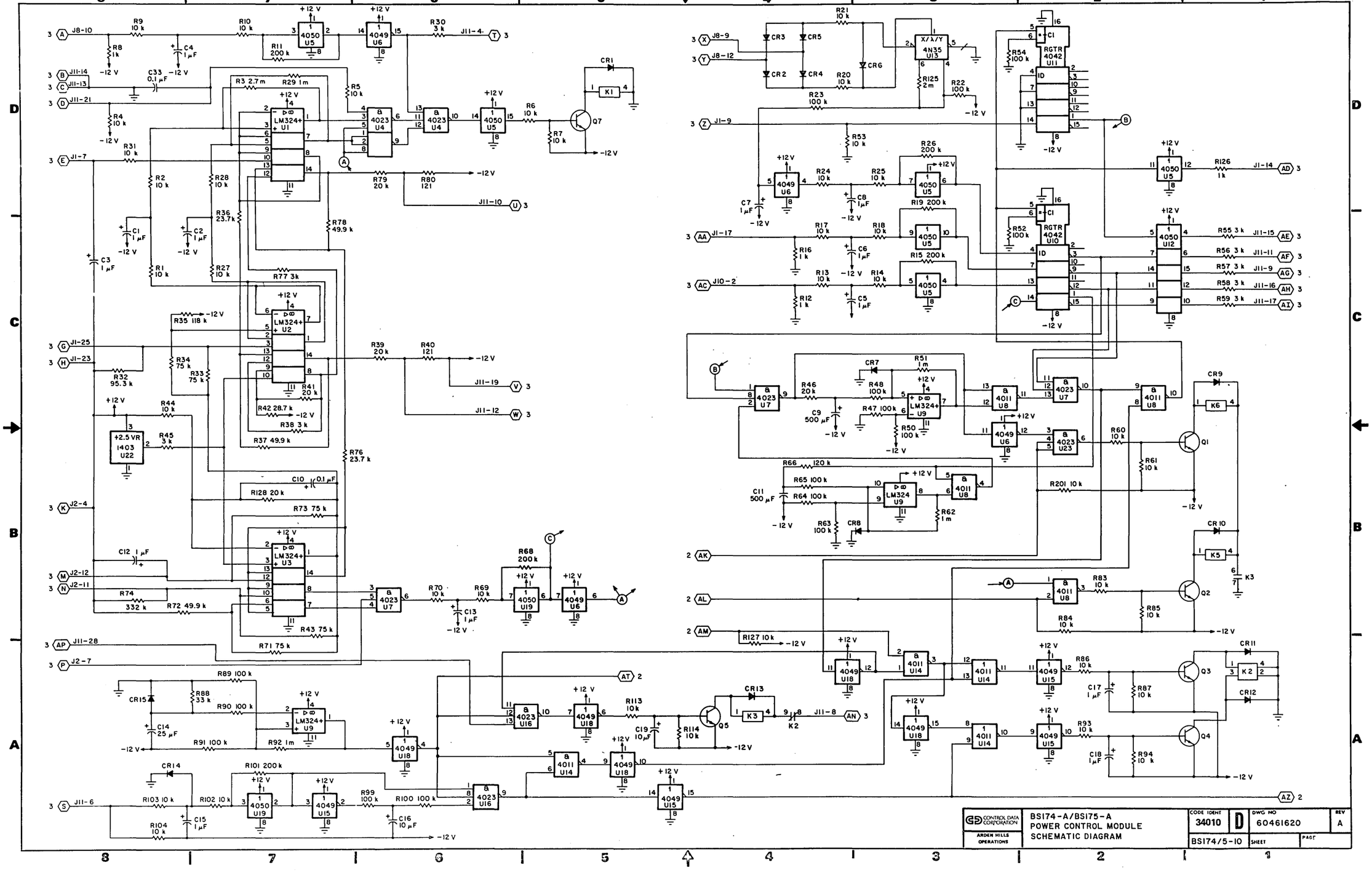
CONTROL DATA CORPORATION / DEVELOPMENT DIVISION	BS174-A/BS175-A POWER SENSING ASSEMBLY SCHEMATIC DIAGRAM	CODE IDENT C	DWG NO 60461620	REV A
			SHEET BS174/5-8	PAGE

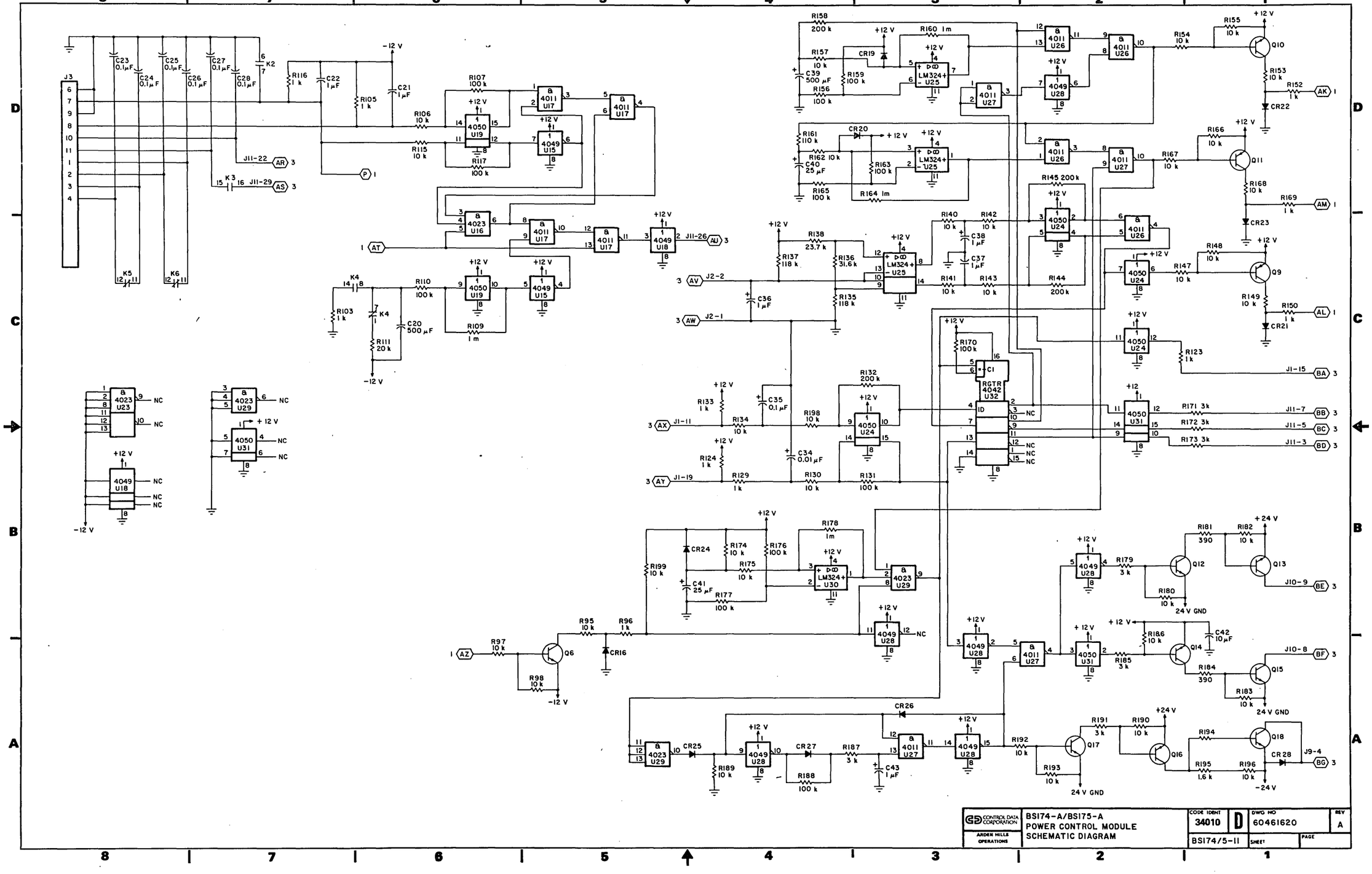


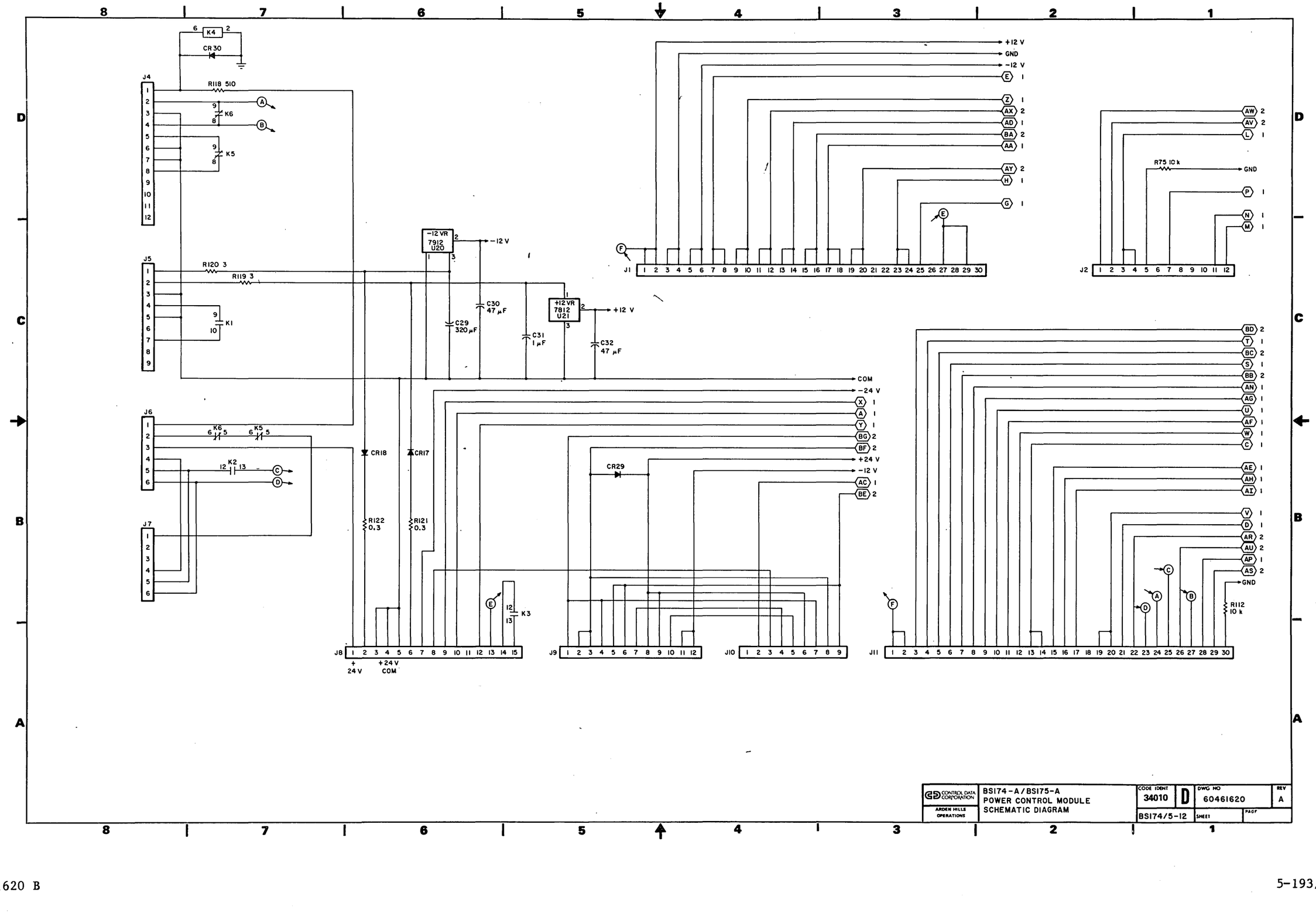
NOTES:

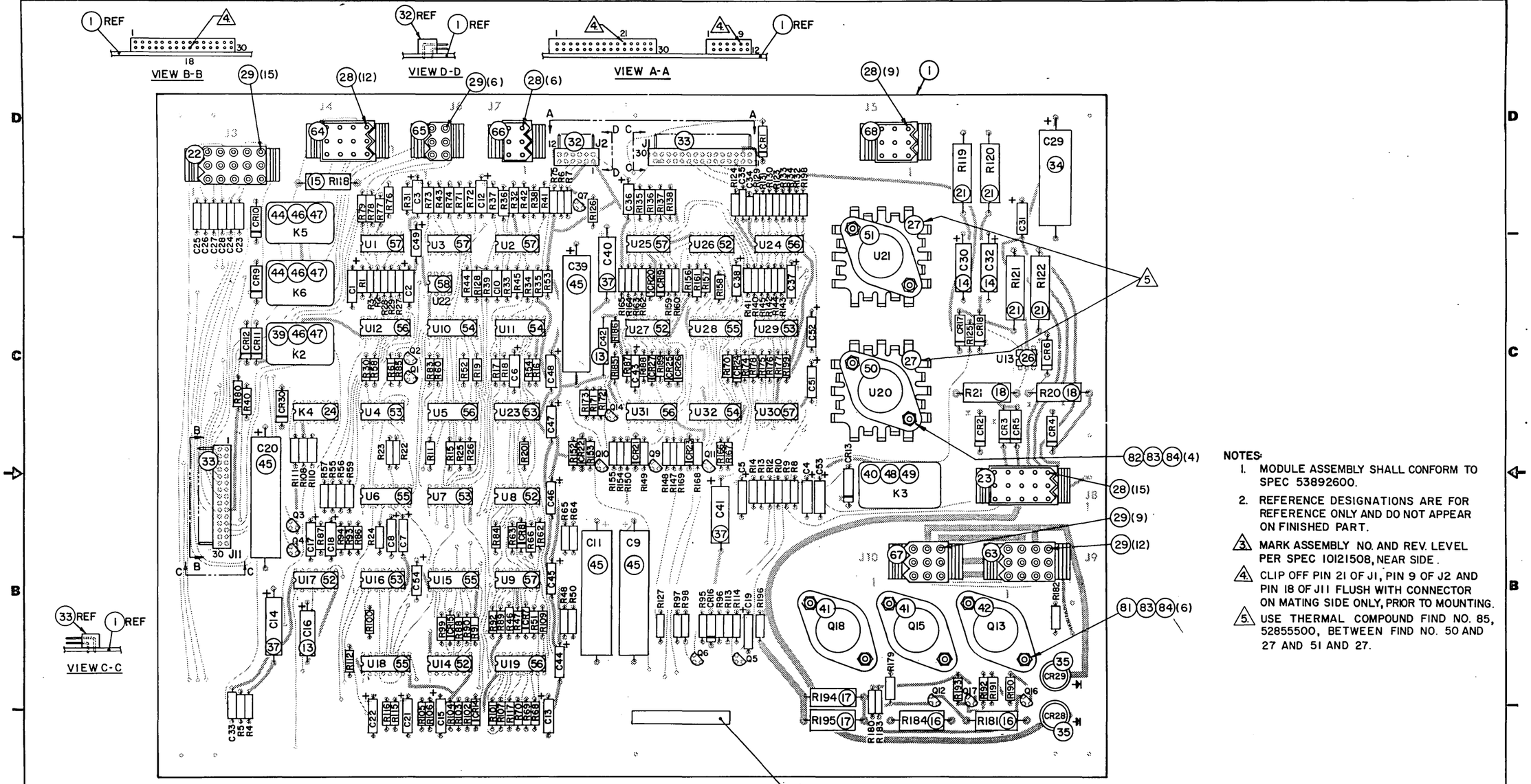
1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
3. INK STAMP ON FAR SIDE ASSEMBLY NO. AND REV PER SPEC 10121502.

CONTROL DATA CORPORATION / DEVELOPMENT DIVISION	BS174-A/BS175-A POWER SENSING ASSEMBLY	CODE IDENT C	DWG NO 60461620	REV A
			SHEET BS174/5-9	PAGE


8
7
6
5
4
3
2
1
D
C
B
A
+12 V
-12 V
R9 10 k
R10 10 k
R11 200 k
R30 3 k
R8 1 k
C4 1 µF
C33 0.1 µF
R4 10 k
R31 10 k
R2 10 k
R28 10 k
R1 10 k
R27 10 k
R36 23.7 k
R78 49.9 k
R77 3k
C1 1 µF
C2 1 µF
C3 1 µF
R3 2.7 m
R29 1 m
R5 10 k
R79 20 k
R80 121
R6 10 k
R7 10 k
Q7
CR1
K1
R35 118 k
R34 75 k
R33 75 k
R32 95.3 k
R41 20 k
R42 28.7 k
R38 3 k
R37 49.9 k
R39 20 k
R40 121
R44 10 k
R45 3 k
+2.5 VR 1403 U22
R76 23.7 k
C10 0.1 µF
R128 20 k
R73 75 k
R74 332 k
R72 49.9 k
R43 75 k
R71 75 k
C12 1 µF
R70 10 k
R69 10 k
C13 1 µF
R68 200 k
R89 100 k
R88 33 k
R90 100 k
R91 100 k
R92 1m
C14 25 µF
CR15
CR14
R101 200 k
R103 10 k
R102 10 k
R104 10 k
C15 1 µF
R99 100 k
R100 100 k
C16 10 µF
R113 10k
C19 10 µF
R114 10k
Q5
CR13
K3
K2
J11-8
AN 3
R21 10 k
CR3
CR5
CR2
CR4
CR6
R20 10 k
R23 100 k
R125 2m
R22 100 k
R53 10 k
R26 200 k
R24 10 k
R25 10 k
C7 1 µF
C8 1 µF
R19 200 k
R17 10 k
R18 10 k
R16 1 k
C6 1 µF
R15 200 k
R13 10 k
R14 10 k
R12 1 k
C5 1 µF
R54 100 k
R52 100 k
R126 1k
R55 3 k
R56 3 k
R57 3 k
R58 3 k
R59 3 k
J11-15
J11-11
J11-9
J11-16
J11-17
R46 20k
R48 100k
R47 100 k
R50 100 k
C9 500 µF
R51 1m
CR7
R66 120 k
R65 100 k
R64 100 k
C11 500 µF
R63 100 k
CR8
R62 1m
R60 10 k
R61 10 k
R201 10 k
CR9
K6
Q1
CR10
K5
K3
Q2
R83 10 k
R85 10 k
R84 10 k
CR11
K2
CR12
Q3
Q4
R86 10 k
R87 10 k
C17 1 µF
R93 10 k
R94 10 k
C18 1 µF
J1-9
J1-17
J10-2
J1-14
J11-14
J11-13
J11-21
J1-7
J1-25
J1-23
J2-4
J2-12
J2-11
J11-28
J2-7
J11-6
J8-9
J8-12
J11-4
J11-10
J11-19
J11-12
AA 2
AB 2
AC 2
AD 3
AE 3
AF 3
AG 3
AH 3
AI 3
AK 2
AL 2
AM 2
AP 3
AT 2
AZ 2
U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U18 U19 U23
CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
BS174-A/BS175-A
POWER CONTROL MODULE
SCHEMATIC DIAGRAM
CODE IDENT 34010
D
DWG NO 60461620
REV A
BS174/5-10
SHEET
PAGE


BSI74-A/BSI75-A
POWER CONTROL MODULE
SCHEMATIC DIAGRAM
CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
CODE IDENT 34010
D
DWG NO 60461620
REV A
BSI74/5-11
SHEET
PAGE
+12 V
-12 V
+24 V
24 V GND
-24 V
LM324+ - U25
LM324+ - U30
RGTR 4042 U32
NC


K4
CR30
J4
R118 510
K6
K5
J5
R120 3
R119 3
K1
J6
K6
K5
K2
J7
CR18
CR17
R122 0.3
R121 0.3
-12 VR 7912 U20
-12 V
+12 VR 7812 U21
+12 V
C30 47 μF
C29 320 μF
C31 1 μF
C32 47 μF
COM
-24 V
CR29
K3
J8
+24 V
+24 V COM
J9
J10
J11
+12 V
GND
-12 V
J1
J2
R75 10 k
R112 10 k
CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
BSI74-A/BSI75-A
POWER CONTROL MODULE
SCHEMATIC DIAGRAM
CODE IDENT 34010
D
DWG NO 60461620
REV A
BSI74/5-12
SHEET 1
PAGE



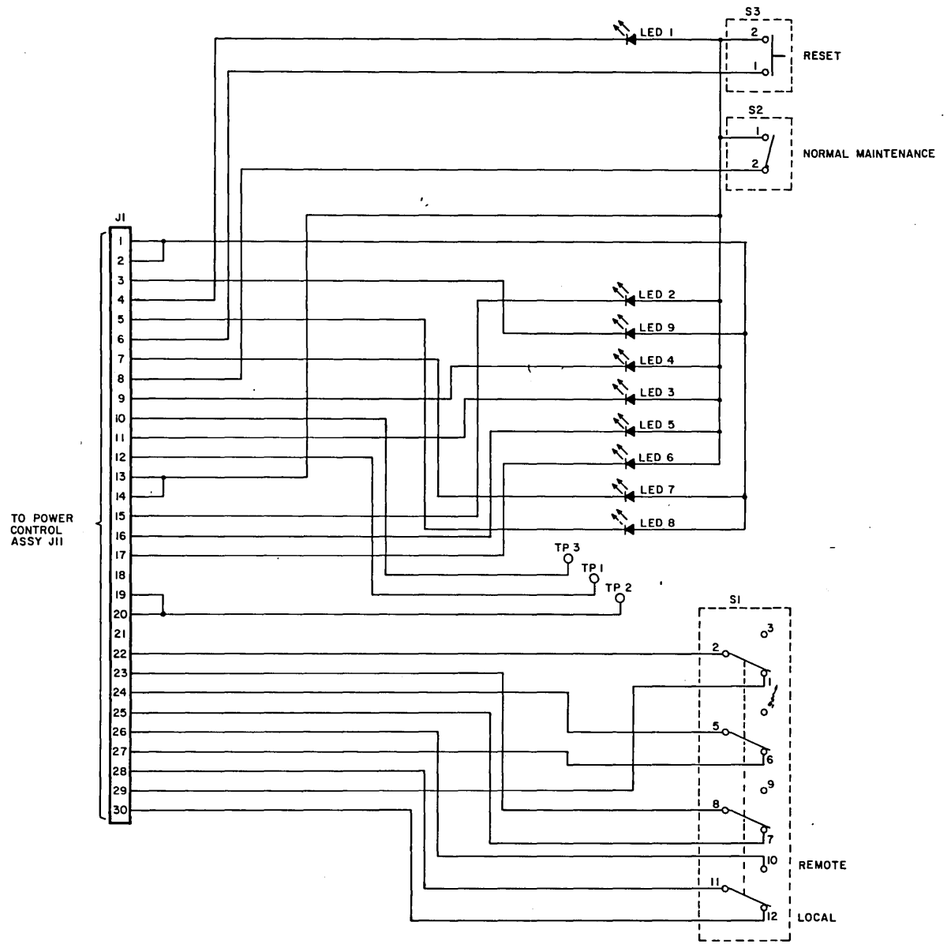
FIND NO.	REFERENCE DESIGNATION
2	R74
3	R40,80
4	R33,34,43,71,73
6	C34
7	C10,23-28,33,35
9	R8,12,16,96,105,108,116,123, 124,126,129,133,150,152,169
10	R30,38,45,55-59,77,171-173,179,185,187,191
11	R1,2,4-7,9,10,13,14,17,18,24, 25,27,28,31,53,60,61,69,70, 75,83-87,93-95,97,98,102-104,106,112-115,127,130,134, 140-143,147-149,153-155,

FIND NO.	REFERENCE DESIGNATION
11	R157,162,166-168,174,175,180, 182,183,186,189,190,192,193, 196,198,199,201
12	R111
14	C30,32
19	C1-8,12,13,15,17-19,21,22,31, 36-38,43-49,51-54
20	CR7,8,14,15,19,20,24,27
25	Q1-7,12,17
30	R161
31	R66
36	R3
38	CR1-6,9-13,17,18,30
43	CR16,21-23,25,26
59	R22,23,47,48,50,52,54,63-65,

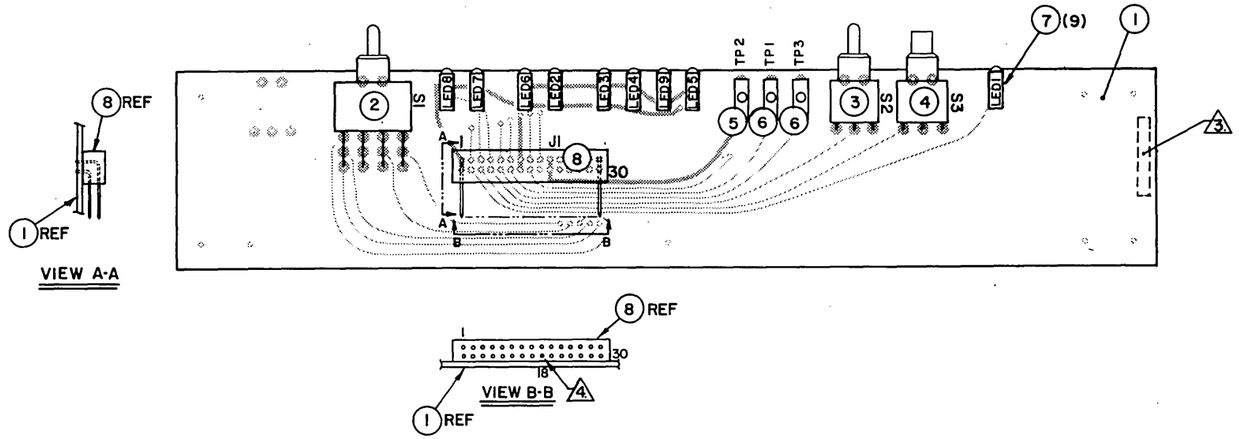
FIND NO.	REFERENCE DESIGNATION
59	R89-91,99,100,107,110,117,131, 156,159,163,165,170,176,177,188
60	R11,15,19,26,68,101,132,144,145,
61	R29,51,62,92,109,160,164,178
62	Q9-11,14,16
69	R32
70	R44
71	R39,41,46,79,128
72	R42
73	R37,72,78
74	R35,137,135
75	R36,76,138
77	R136

FIND NO.	REFERENCE DESIGNATION
78	R125
79	R88
80	R158

CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BSI74-A/BSI75-A POWER CONTROL MODULE ASSEMBLY DIAGRAM	CODE IDENT 34010	D	DWG NO 60461620	REV A
		BSI74/5-13		SHEET	



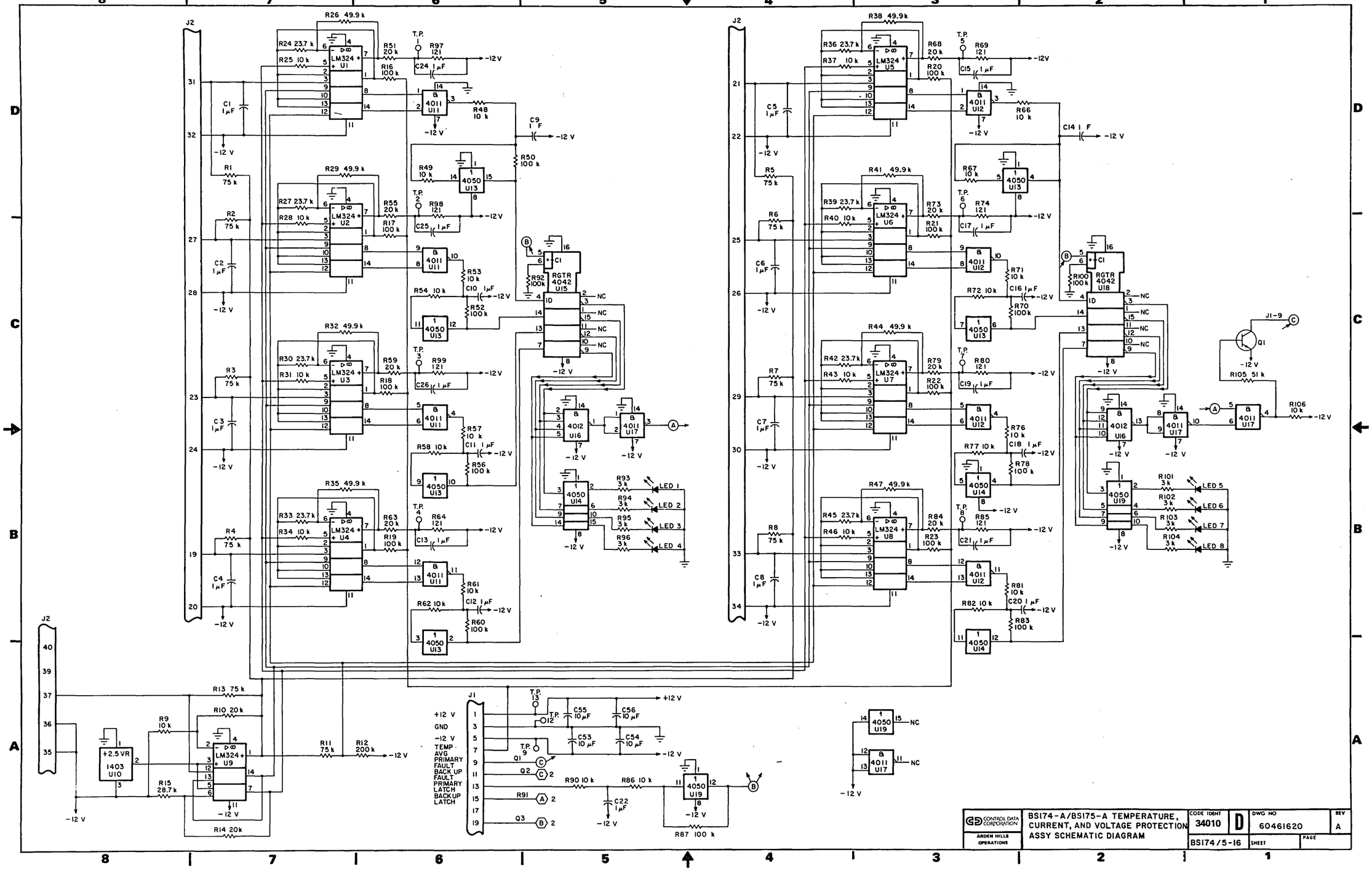
CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BSI74-A/BSI75-A POWER CONTROL INDICATOR SCHEMATIC DIAGRAM	CODE IDENT 34010	D	DWG NO 60461620 REV A
		BSI74/5-14	SHEET	PAGE

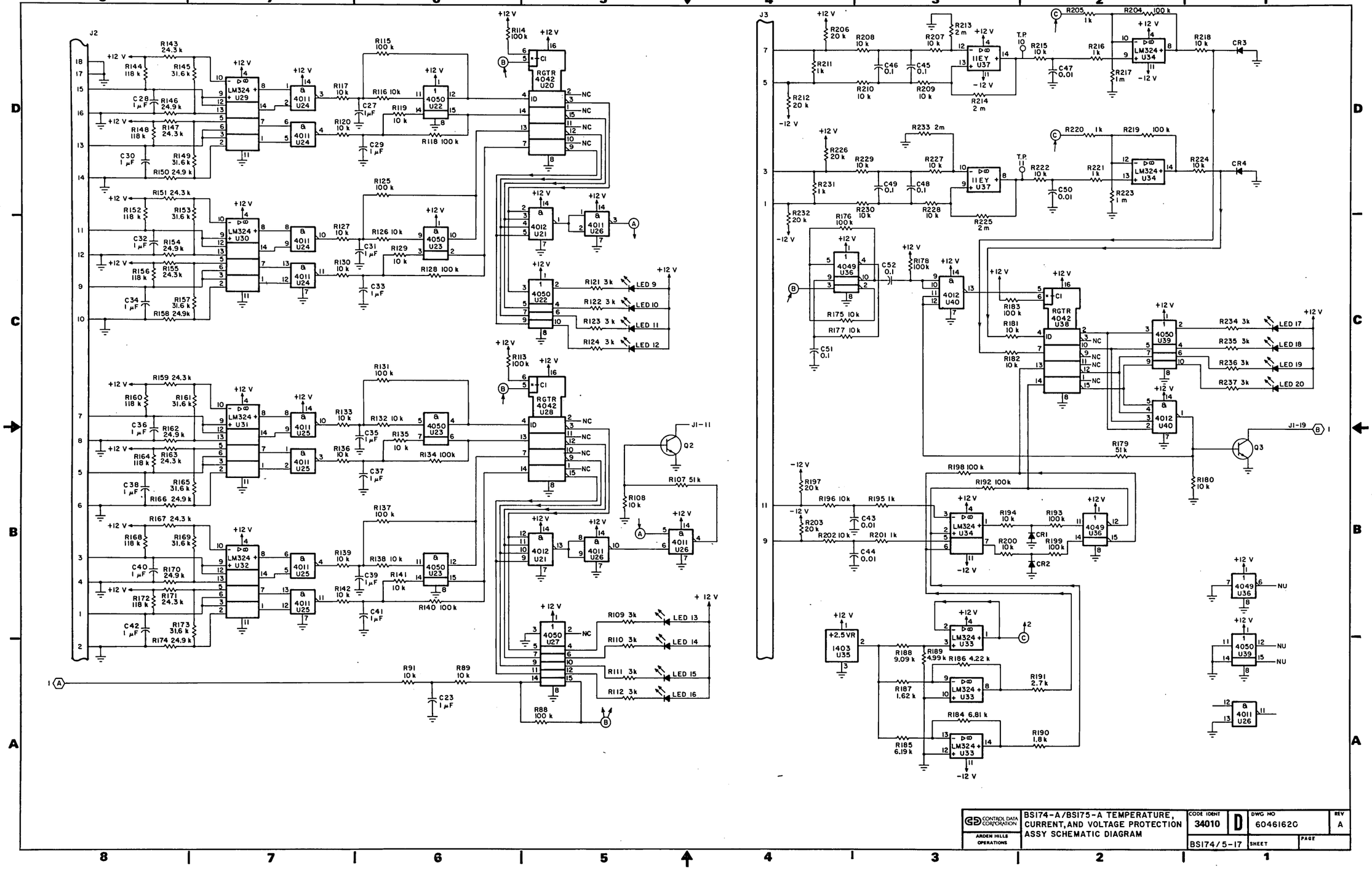


NOTES:

1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
3. INK STAMP ASSEMBLY NO. AND REV ON FAR SIDE PER SPEC 10121502 .
4. CLIP OFF PIN 18 OF J1 FLUSH WITH CONNECTOR, ON MATING SIDE ONLY PRIOR TO MOUNTING.

CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BSI74-A/BSI75-A POWER CONTROL INDICATOR ASSEMBLY DIAGRAM	CODE IDENT 34010	D	DWG NO 60461620 REV A
		BSI74/5-15	SHEET	


J2
R26 49.9 k
R24 23.7 k
R25 10 k
LM324 + U1
R51 20 k
R16 100 k
T.P. 1
R97 121
C24 1 µF
-12 V
4011 U11
R48 10 k
C9 1 F
C1 1 µF
R1 75 k
R50 100 k
R29 49.9 k
R27 23.7 k
R28 10 k
LM324 + U2
R55 20 k
R17 100 k
R49 10 k
4050 U13
T.P. 2
R98 121
C25 1 µF
R2 75 k
C2 1 µF
R53 10 k
C10 1 µF
R54 10 k
R52 100 k
R92 100k
RGTR 4042 U15
NC
R32 49.9 k
R30 23.7 k
R31 10 k
LM324 + U3
R59 20 k
R18 100 k
T.P. 3
R99 121
C26 1 µF
R3 75 k
C3 1 µF
R57 10 k
C11 1 µF
R58 10 k
R56 100 k
4012 U16
R93 3 k
R94 3 k
R95 3 k
R96 3 k
LED 1
LED 2
LED 3
LED 4
R35 49.9 k
R33 23.7 k
R34 10 k
LM324 + U4
R63 20 k
R19 100 k
T.P. 4
R64 121
C13 1 µF
R4 75 k
C4 1 µF
R61 10 k
C12 1 µF
R62 10 k
R60 100 k
R38 49.9k
R36 23.7 k
R37 10 k
LM324 + U5
R68 20 k
R20 100 k
T.P. 5
R69 121
C15 1 µF
4011 U12
R66 10 k
C5 1 µF
C14 1 F
R5 75 k
R41 49.9 k
R39 23.7 k
R40 10 k
LM324 + U6
R73 20 k
R21 100 k
R67 10 k
4050 U13
T.P. 6
R74 121
C17 1 µF
R6 75 k
C6 1 µF
R71 10 k
R72 10 k
C16 1 µF
R70 100k
R100 100 k
RGTR 4042 U18
R44 49.9 k
R42 23.7k
R43 10 k
LM324 + U7
R79 20 k
R22 100 k
T.P. 7
R80 121
C19 1 µF
R7 75 k
C7 1 µF
R76 10 k
R77 10 k
C18 1 µF
R78 100 k
R47 49.9 k
R45 23.7k
R46 10 k
LM324 + U8
R84 20 k
R23 100 k
T.P. 8
R85 121
C21 1 µF
R8 75 k
C8 1 µF
R81 10 k
R82 10 k
C20 1 µF
R83 100 k
J1-9
Q1
R105 51 k
R106 10 k
R101 3 k
R102 3 k
R103 3 k
R104 3 k
LED 5
LED 6
LED 7
LED 8
J2
R13 75 k
R10 20 k
R9 10 k
+2.5 VR 1403 U10
LM324 + U9
R11 75 k
R12 200 k
R15 28.7 k
R14 20k
J1
+12 V
GND
-12 V
TEMP AVG
PRIMARY FAULT
BACK UP FAULT
PRIMARY LATCH
BACK UP LATCH
T.P. 13
T.P. 12
T.P. 9
C55 10 µF
C56 10 µF
C53 10 µF
C54 10 µF
Q1
Q2
R91
Q3
R90 10 k
R86 10 k
C22 1 µF
R87 100 k
CONTROL DATA CORPORATION
ARDEN HILLS OPERATIONS
BSI74-A/BSI75-A TEMPERATURE, CURRENT, AND VOLTAGE PROTECTION ASSY SCHEMATIC DIAGRAM
CODE IDENT 34010
D
DWG NO 60461620
REV A
BSI74/5-16
SHEET
PAGE



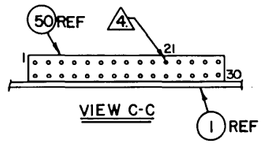
CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BSI74-A/BSI75-A TEMPERATURE, CURRENT, AND VOLTAGE PROTECTION ASSY SCHEMATIC DIAGRAM	CODE IDENT 34010	D	DWG NO 60461620	REV A
		BSI74/5-17	SHEET	PAGE	

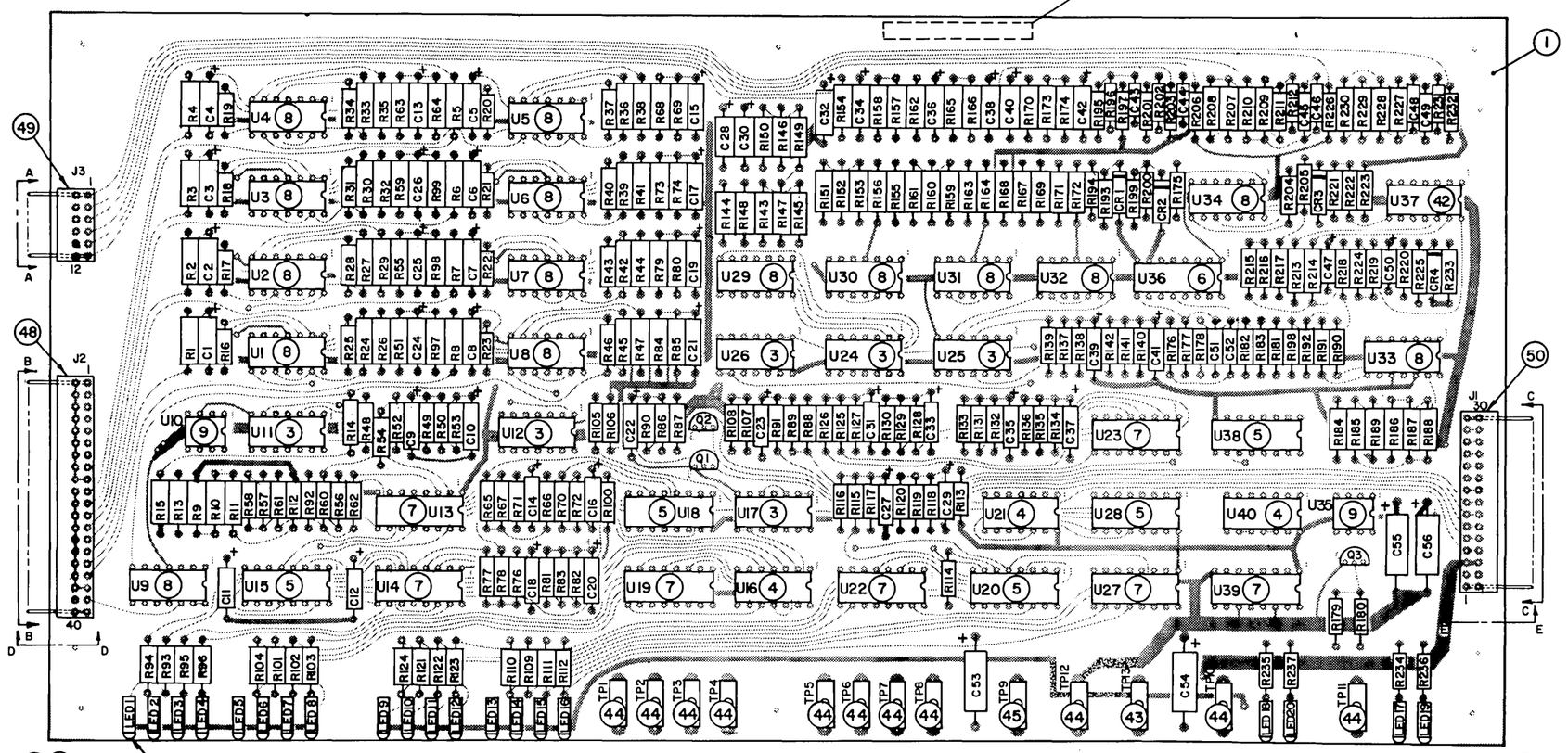
F/N	REFERENCE DESIGNATION
2	CRI-CR4
3	UI1,UI2,UI7,U24,U25,U26
4	UI6,U21,U40
5	UI5,UI8,U20,U28,U38
6	U36
7	UI3,UI4,UI9, U22,U23,U27,U39
8	UI-U9, U29-U34
9	UI0, U35
10	RI05,RI07,RI79
11	RI14, RI15,RI18, RI25,RI28,RI31, RI34,RI37,RI76, RI78,RI83,RI92, RI93, RI98,RI99,R204,R219,R140,

F/N	REFERENCE DESIGNATION
11	R50,R52, R56,R60,R65,R70,R78, R83, R87, R88,R92,RI00,RI13
12	RI12
13	R217, R223
14	R9, R207-R210, R227-R230
15	RI85
16	RI87
17	RI86
18	RI0, RI4, R51, R55,R59,R63,R68, R73,R79, R84
19	RI84
20	RI89

F/N	REFERENCE DESIGNATION
21	RI88
22	RI5
23	RI46,RI50,RI54,RI58,RI62,RI66,RI70, RI74
24	R143,RI47,RI51, RI55,RI59,RI63,RI67, RI71
25	R26, R29,R32, R35, R38,R41, R44, R47
26	RI44,RI48,RI52,RI56,RI60,RI64,RI68, RI72
27	R24, R27, R30, R33, R36 ,R39, R42, R45
28	R213,R214,R225,R233

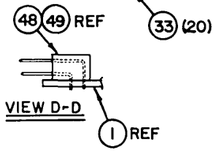
F/N	REFERENCE DESIGNATION
29	R64, R69, R74, R80, R85, R97, R98, R99
30	RI45,RI49,RI53,RI57,RI61, RI65, RI69,RI73
31	C43, C44, C47, C50
32	C45, C46,C48, C49, C51, C52
33	LEDI-LED20
34	RI95,R201,R205,R211, R216,R220, R221,R231
35	RI90

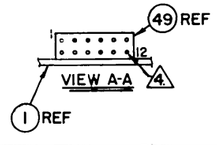


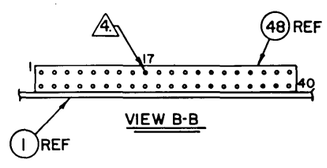


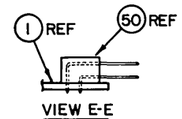
NOTES:

1. REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON FINISHED PART.
2. MODULE ASSEMBLY SHALL CONFORM TO SPEC 53892600.
3. INK STAMP ASSEMBLY NO. AND REV ON FAR SIDE PER SPEC 10121502.
4. CLIP OFF PIN 21 OF J1, PIN 17 OF J2 AND PIN 12 OF J3 FLUSH WITH CONNECTOR, MATING SIDE ONLY PRIOR TO MOUNTING.









F/N	REFERENCE DESIGNATION
36	RI91
37	R93-R96, RI0I-RI04,RI09-RI12, RI2I-RI24,R234-R237
38	R48,R49,R53,R54,R57,R58, R61,R62,R66,R67,R71,R72, R76,R77,R81,R82,R25,R28, R31,R34,R37,R40,R43,R46, R86,R89,R90,R91,RI06,RI08, RI16,RI17,RI19,RI20,RI26,RI27, RI29,RI30,RI32,RI33,RI35,RI36, RI38,RI39,RI4I,RI42,RI75,RI77, RI80,RI8I,RI82,RI94,RI96,R200, R202,R215,R218,R222,R224

F/N	REFERENCE DESIGNATION
39	RI97,R203,R206,R212,R226,R232
40	C53-C56
41	CI - C42
42	U37
43	TPI3
44	TPI-TP8,TPI0,TPII,TPI2
45	TP9

F/N	REFERENCE DESIGNATION
46	RI6- R23
47	QI-Q3
48	J2
49	J3
50	JI
51	RI-R8, RII,RI3

CONTROL DATA CORPORATION ARDEN HILLS OPERATIONS	BSI74-A/BSI75-A TEMP, CURRENT, AND VOLTAGE PROTECTION ASSEMBLY DIAGRAM	CODE IDENT 34010	D	DWG NO 60461620	REV A
		BSI74/5-18	SHEET		

This section contains maintenance and field removal and replacement procedures.

INTRODUCTION

The maintenance section is divided into preventive maintenance and component field removal and replacement. Preventive maintenance consists of periodic observations of a system. Field removal and replacement procedures for system components are a final solution to persistent maintenance problems.

Refer to figures 6-1 through 6-7 for the location of system components described in this section.

MAINTENANCE AIDS

Maintenance Aids lists tools, test equipment, and materials that are required for power system maintenance.

Table 6-1 lists tools, test equipment, and materials required for preventive/corrective maintenance tasks and procedures.

Table 6-1. Power System Maintenance Aids

Service Center Tools and Materials		
Tool or Material	Part Number	Use
Digital Voltmeter, John Fluke 8020A	12263279	General voltage measurements
Freon, spray	12210068	PRI LO Temperature Fault Shutdown Check
Heat Gun, 850W	12259173	Thermostat Check
Screwdriver, POT adjustment nonmetallic w/pocket clip (tweeker)	12212278	Meter calibration

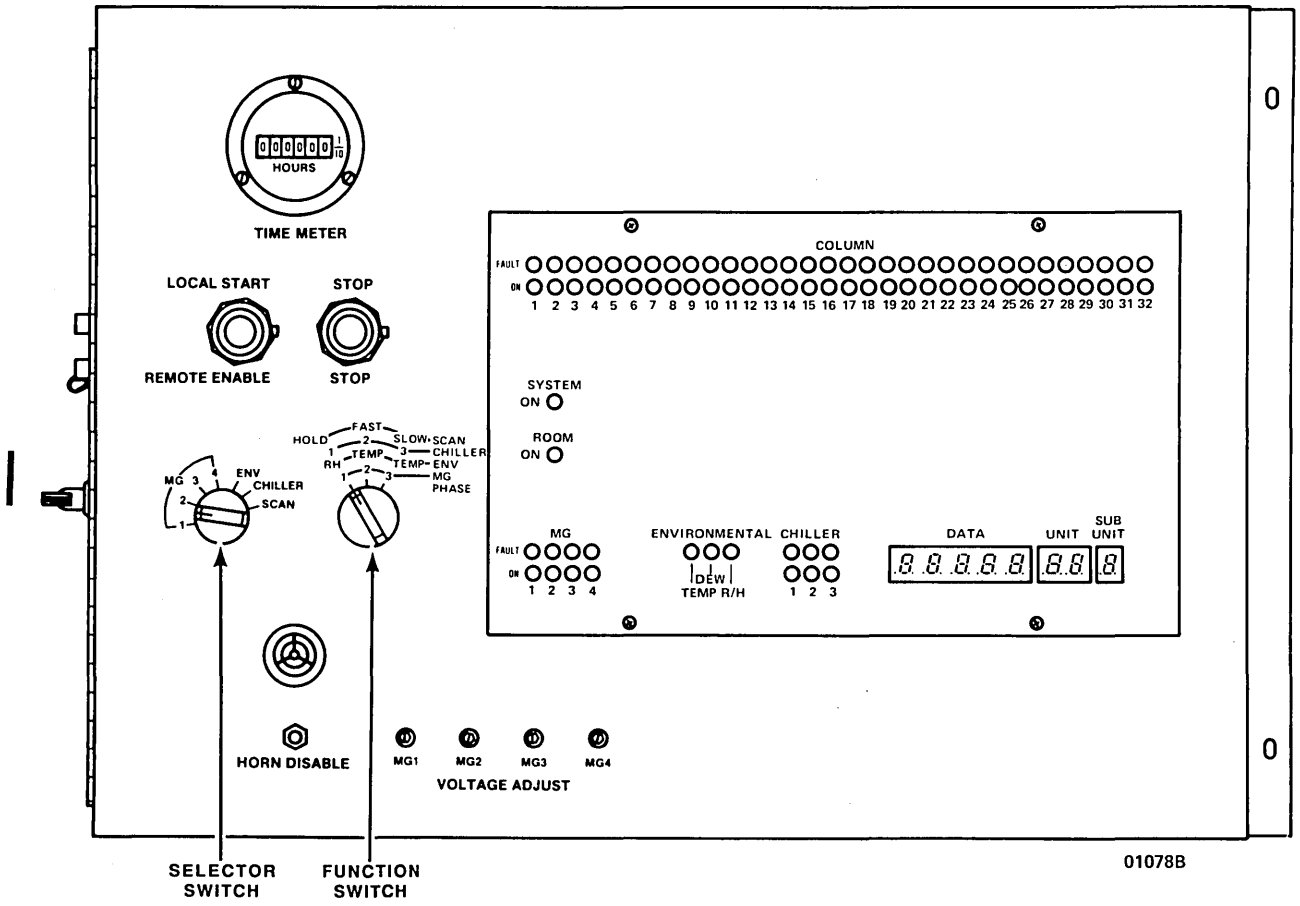


Figure 6-1. SPM Front Panel

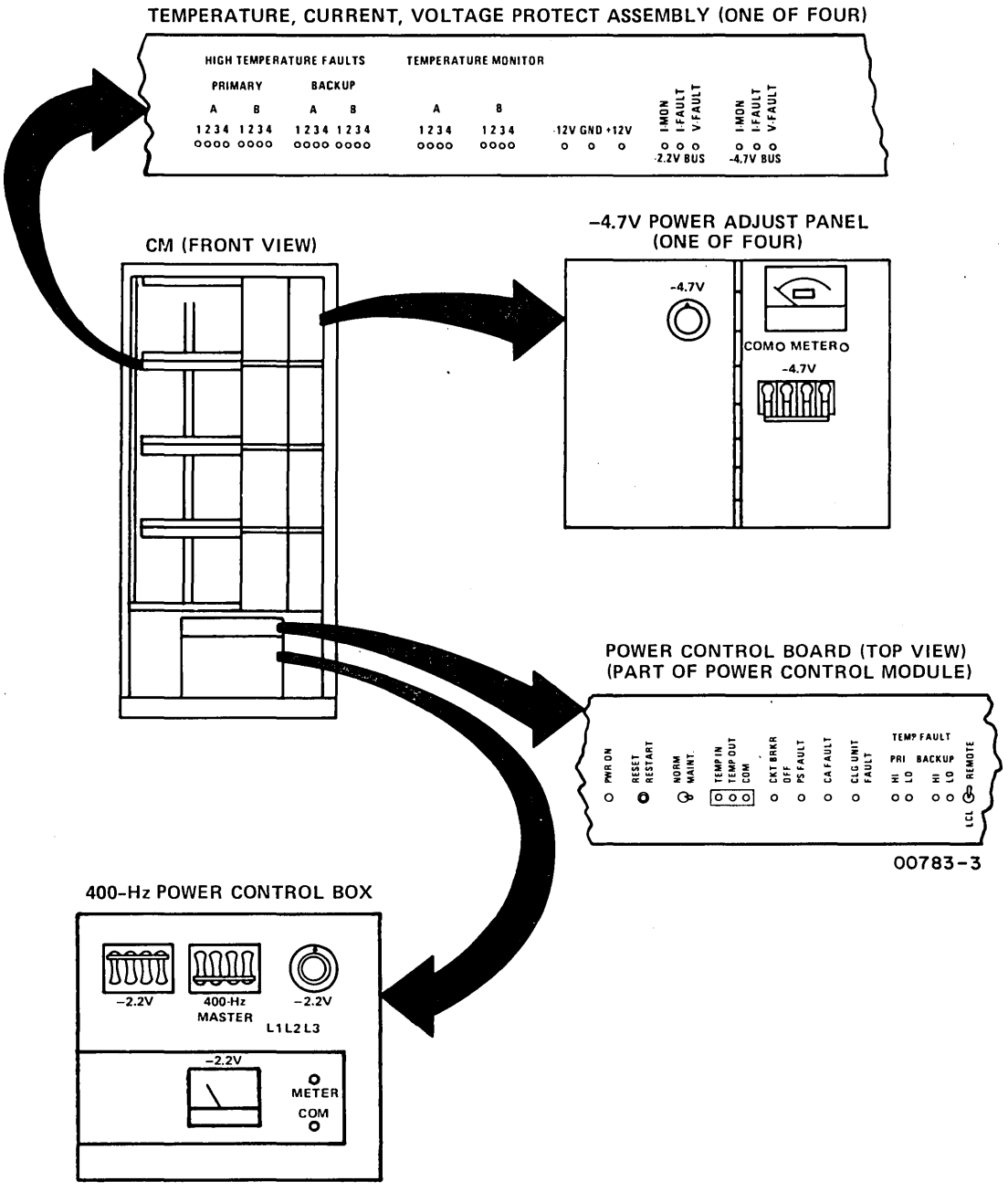


Figure 6-2. BS174-A/BS175-A Central Memory Controls and Indicators (Right-Hand View)

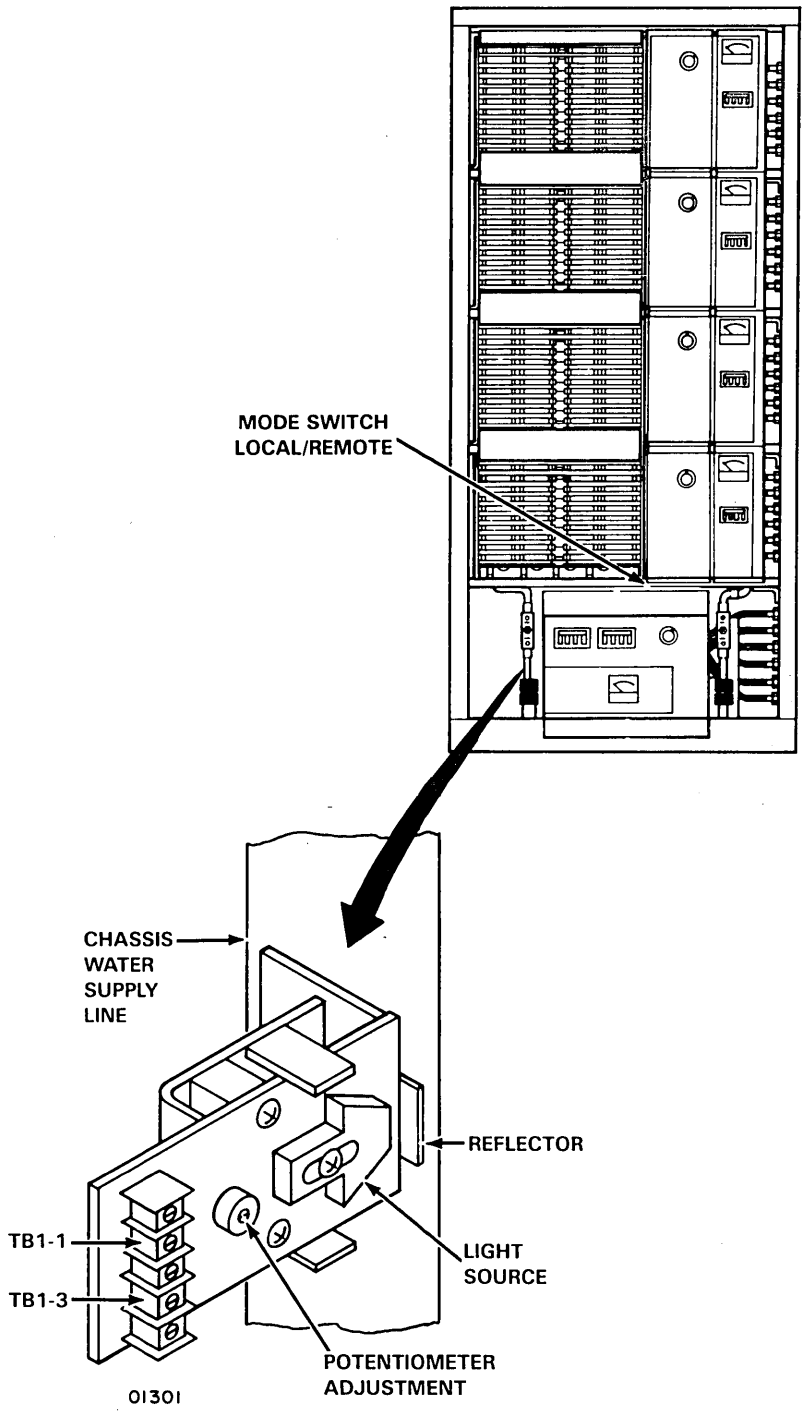


Figure 6-3. Low-temperature Sensor Assembly in CM

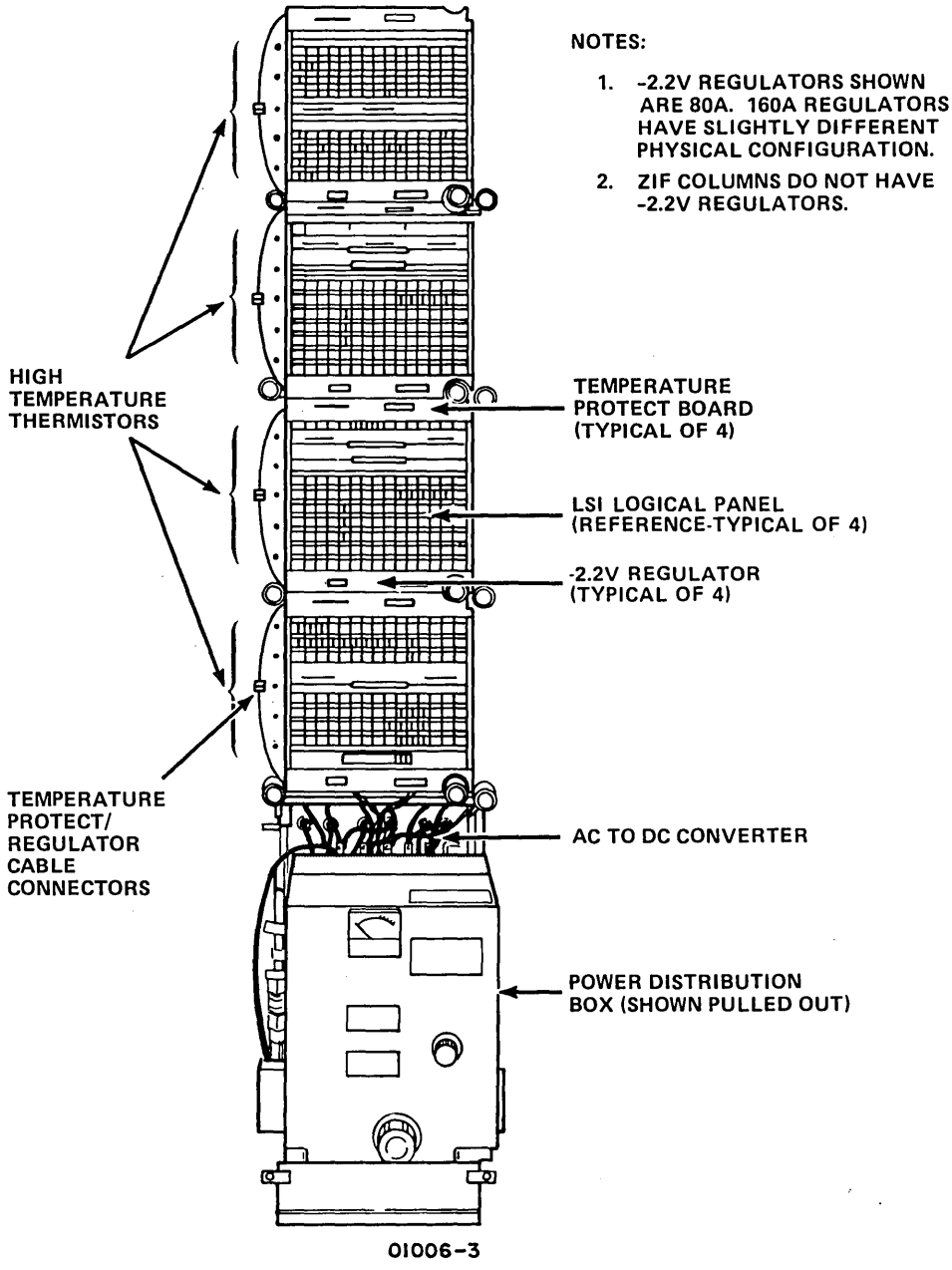


Figure 6-4. Column Power Components Locations

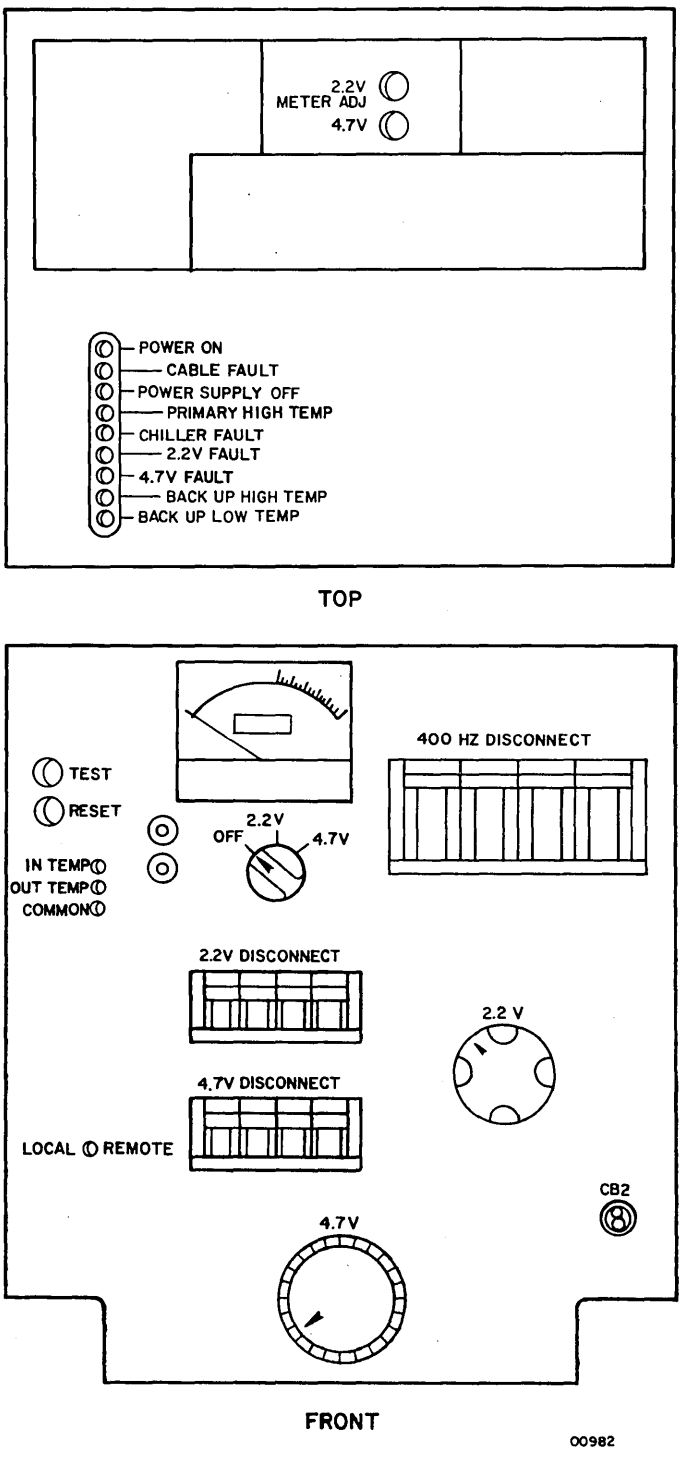


Figure 6-5. LSI and ZIF Column Power Distribution Box Controls and Indicators

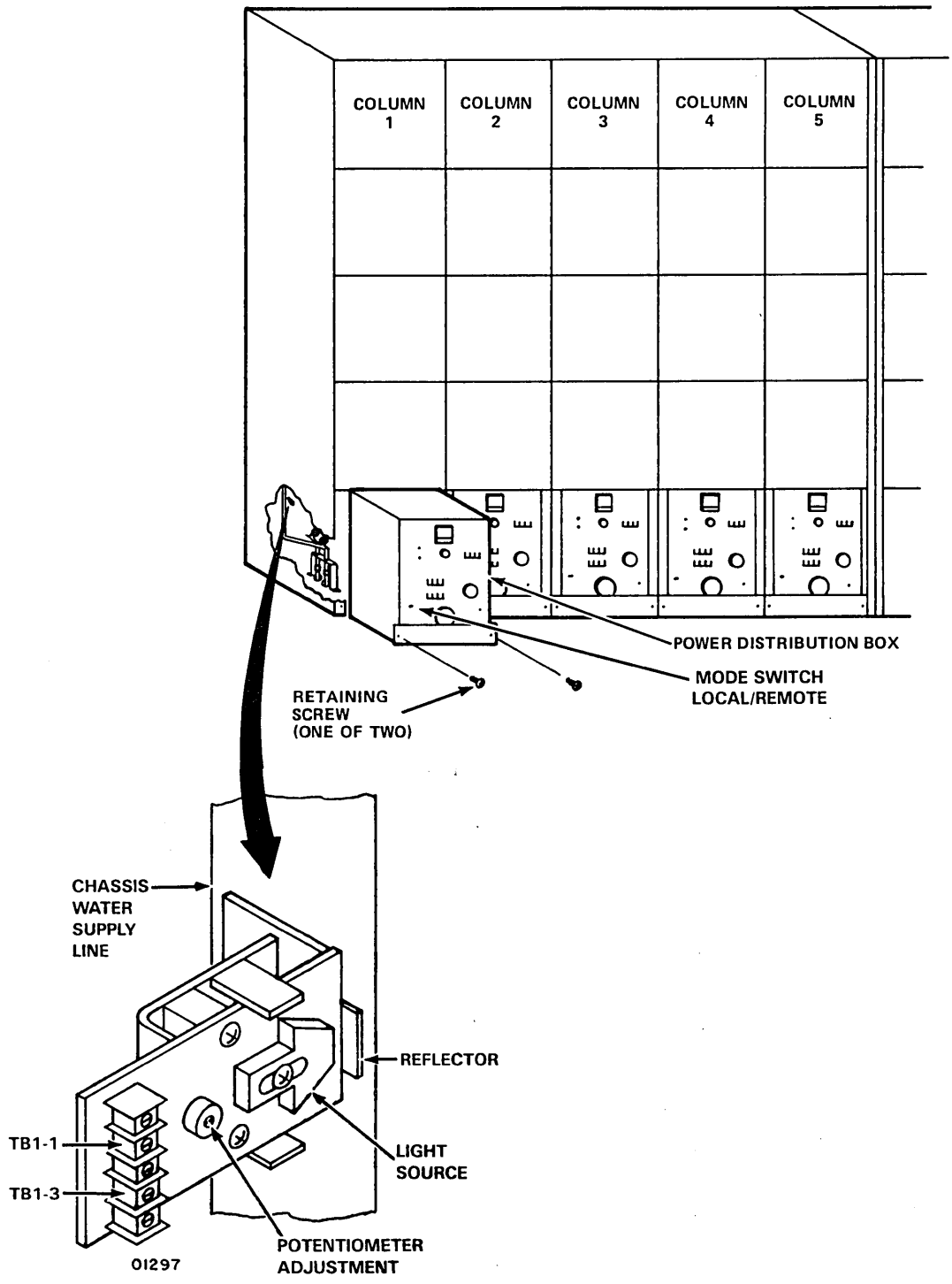


Figure 6-6. Low-temperature Sensor Assembly in CP and CMC Columns

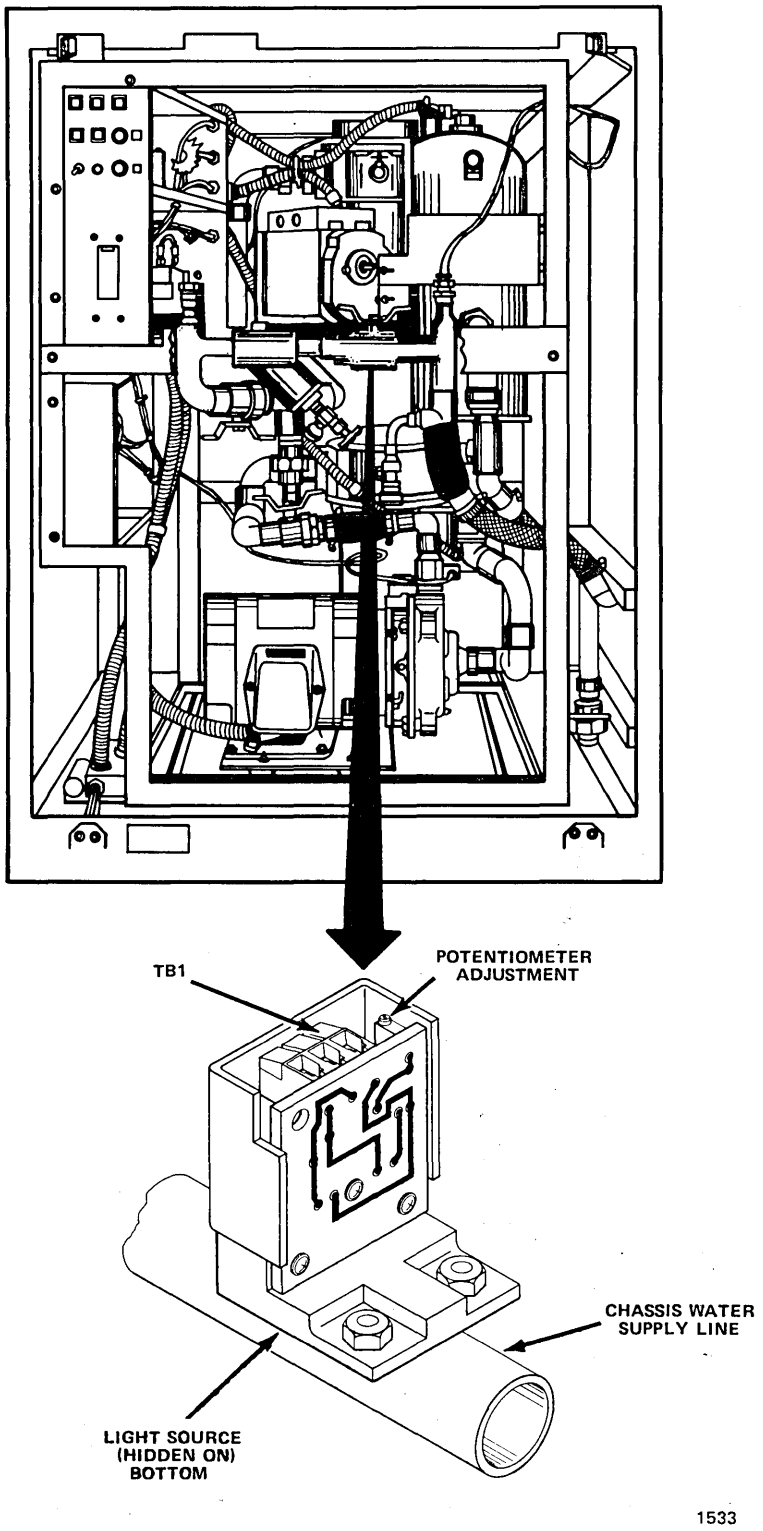


Figure 6-6.1. Low-temperature Sensor Assembly (GH251-C)

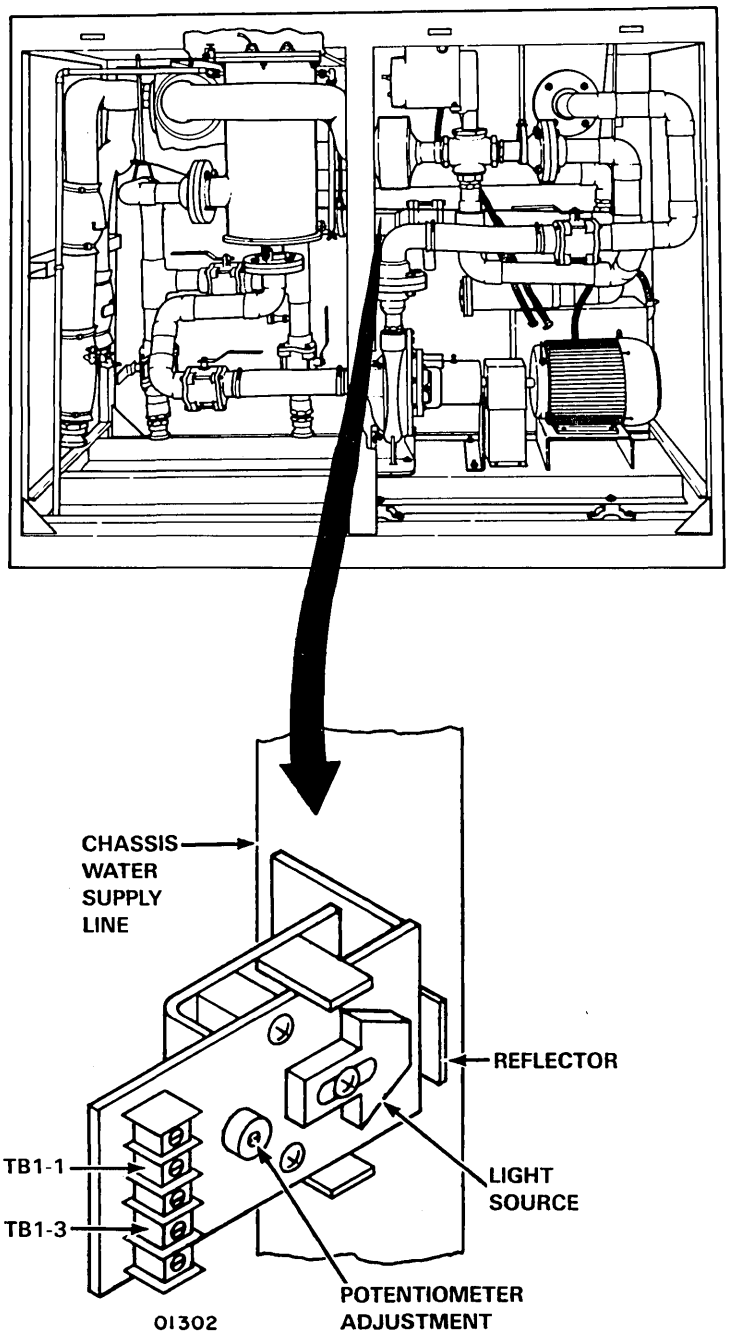


Figure 6-7. Low-temperature Sensor Assembly (GH252-A)

PREVENTIVE MAINTENANCE

Preventive maintenance, consisting of periodic inspections and tests, reduces downtime by anticipating problems before they occur. Procedures for accomplishing the tasks are provided following the list of tasks (Table 6-2). These procedures are performed at scheduled maintenance intervals while the system is operating. Consult regional technical support if preventive maintenance procedures do not perform as required.

PREVENTIVE MAINTENANCE TASKS (PMT)

Annually perform preventive maintenance tasks listed in table 6-2. This section contains maintenance information for AD112-C/AD113-A, AD115/AD116-A, AD115/AD116-B, AD118-A, and BS174-A/BS175-A.

Table 6-2. Preventive Maintenance Tasks (PMT)

Task Description	Page
Antistatic Wrist Strap Test - 7CX00011-B	6-10
Static-Sensitive Parts Handling - 7CX00012-B	6-11
System Power Monitor Corrective Maintenance - 7CX00028-B	6-12
Water Cooling Unit Temperature Sense Lines Check	6-14
HI Temp Fault and Shutdown Check (BS174-A/BS175-A)	6-14
LO Temp Shutdown Check (BS174-A/BS175-A)	6-15
Cable Fault Shutdown Check (BS174-A/BS175-A)	6-15
CKT BRKR Off Fault Shutdown Check (BS174-A/BS175-A)	6-16.1
Long/Short Warning Check (BS174-A/BS175-A)	6-16.1
OV/OC Check (BS174-A/BS175-A)	6-17
PRI LO Temp Fault Shutdown Check (BS174-A/BS175-A)	6-17
Thermostat Check (BS174-A/BS175-A)	6-18
Cable Fault Check (LSI/ZIF)	6-18
Column PWR Supply Off Fault Check (LSI)	6-19
Column Thermistor Temperature-Protect Fault Check (LSI/ZIF/CMC)	6-19
Column 2.2-V/4.7-V Adjustment and Percent Meter Calibration (LSI)	6-20
Diode Heat Sink High Temp Back-up Check (LSI)	6-21
Long/Short Warning Check (CPU)	6-22
Regulator Cable Fault Check (LSI)	6-22
System Warning Check	6-22
Transient Check	6-23
Low Temperature Fault/Adjustment	6-23

Antistatic Wrist Strap Test - 7CX00011-B

Required Items

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
Make locally	Hand-held electrode
Local supply	20/30-V, current-limited ohmmeter

Introduction

This procedure tests the performance of an antistatic wrist strap and its grounding cord. The procedure requires the following items:

- An electrode for the person wearing the wrist strap to hold. A 3-in (75 mm) length of #304 stainless steel round stock 1-in (25 mm) in diameter is suitable. Attach a banana plug receptacle or screw connector to one end of the electrode.
- An ohmmeter capable of measuring high resistance (0-100 megohms) with enough voltage to overcome skin resistance. Suggested meters include the Simpson Model 269 (20-V at 0.2 uA) and the Triplett Model 630PL (30-V at 0.3 uA).

Test Procedure

1. Put on antistatic wrist strap.
2. Attach ground lead of ohmmeter to banana plug end of wrist strap grounding cord.
3. Attach positive lead of ohmmeter to electrode.
4. Holding electrode in hand, rotate wrist to simulate normal working motion while observing resistance measurement on meter. Hold metal tab on wrist strap away from wrist to ensure metal fibers in strap are being tested without benefit of tab. Resistance must be greater than 0.5 megohm but less than 10 megohms. At 10-megohm level, wearer generates less than 10-V from capacitive change or friction-generated means. The 0.5 megohm level provides adequate current limiting protection for wearer.
5. If resistance value is too high or low, check wrist strap and grounding cord separately to locate cause.

Static-Sensitive Parts Handling - 7CX00012-B

Required Items

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
00217372	Antistatic container for LSI panel assembly
12263495	Antistatic work pad
Local supply	Antistatic floor mat

Introduction

Static-sensitive parts include most semiconductor devices and assemblies containing them. Follow these procedures to avoid destroying parts by static discharge.

Part Removal/Replacement

1. Before removing part, obtain antistatic bag or container in which to place part.
2. Stand on antistatic floor mat.
3. Put on antistatic wrist strap and connect wrist strap grounding cord to equipment ground.
4. Touch metal frame of equipment before touching part.
5. Remove part and place it in antistatic bag or container before stepping off mat or removing wrist strap.

Part Handling at Repair Station

1. Place part, in antistatic bag or container, on work surface fitted with antistatic pad connected to raised-floor grid ground.
2. Put on antistatic wrist strap and connect wrist strap grounding cord to repair station ground.
3. Sit at repair station.
4. Remove part from antistatic bag or container.
5. After repairing part, replace it in antistatic bag or container before removing wrist strap.

System Power Monitor Corrective Maintenance - 7CX00028-B

Required Items

Part Number	Item
Local supply	Flat-blade screwdriver
Local supply	Phillips screwdriver
12263496	Antistatic wrist strap (large) with grounding cord.
12263623	Antistatic wrist strap (small) with grounding cord.
12263499	Antistatic bag

References

This procedure references the following procedure:

7CX00012 Static Sensitive Parts Handling

Introduction

Although most assemblies and parts in the system power monitor (SPM) are field replaceable, they are not field repairable. All power must be removed from the system as well as from the SPM before attempting any repairs in the SPM.

Power Removal

1. Remove power from system as specified in Power Distribution and Warning Manual for system being serviced.
2. Set SYSTEM DISCONNECT switch on left side of SPM to OFF.

NOTE

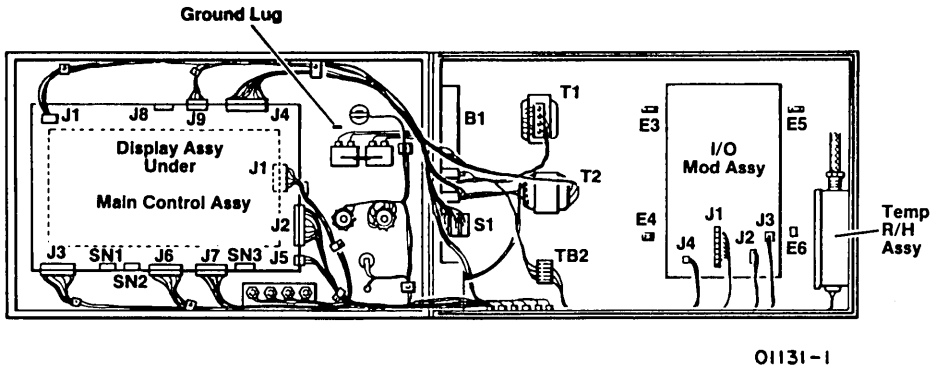
When SYSTEM DISCONNECT switch is OFF, the only power present in the SPM is on the input terminals of the SYSTEM DISCONNECT switch.

Power Application

1. Set SYSTEM DISCONNECT switch to ON.
2. Apply power to system as specified in power distribution and warning manual for the system being serviced.

Control I/O Board Removal

1. Remove power from SPM.
2. Remove two screws on right side of SPM door assembly, swing door open.
3. Put on antistatic wrist strap and connect wrist strap grounding cord to ground lug on inside of SPM door.



SPM Component Location

4. Remove eight connectors from board.
5. Remove eight screws holding board to SPM door.
6. Remove board, place in antistatic bag.

Control I/O Board Replacement

Replacement consists of reversing removal procedure. In addition, set switches on replacement board same as on removed board.

Master Display Board Removal

1. Remove power from SPM.
2. Remove control I/O board. Do not remove antistatic wrist strap.
3. Remove connector A1J4 from board.
4. Remove 23 screws holding board to SPM door.
5. Remove board, place in antistatic bag.

Master Display Board Replacement

Replacement consists of reversing removal procedure.

Water Cooling Unit Temperature Sense Lines Check

This procedure is performed on the wall-mounted SPM. Refer to SPM Front Panel Controls and Indicators (figure 6-1) when performing this procedure.

1. Locate two rotary switches at left front of SPM.
2. Select CHILLER position on left selector switch.
3. Select CHILLER 1 position on right function switch.
4. Observe temperature displayed on SPM. Temperature is within $\pm$ 2 °C ($\pm$3 °F) of temperature read on water cooling unit chassis temperature gauge.
5. If readings do not agree, refer to Cooling System Maintenance Manual listed in the preface for calibration of water cooling unit chassis temperature gauge.

HI Temp Fault and Shutdown Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to power control board and TCVP board (figure 6-2) when performing this procedure.

NOTE

To save maintenance time, perform this procedure in conjunction with the OV/OC Check in this section.

1. With column power applied, remove two top screws securing TCVP board to top cage.
2. Pull TCVP board out far enough to gain access to left-hand connectors.
3. Unplug left front connector (J2) on TCVP board. All 16 hi temp fault LEDs on TCVP board light and 2.5 seconds later all four -4.7 V circuit breakers on power adjust panels trip, -2.2 V circuit breaker on 400-Hz power control box trips, and CKT BRKR OFF LED on power control board lights.
4. Wait ten seconds, then replug connector J2. CKT BRKR OFF and all 16 hi temp fault LEDs stay lit and TEMP FAULT PRI HI and BACK UP HI LEDs on power control board light.
5. Press and release RESET/RESTART switch on power control board. All LEDs except CKT BRKR OFF go off.
6. Reset circuit breakers.
7. Press and release RESET/RESTART switch again. CKR BRKR OFF LED goes off.
8. Replace TCVP board.
9. Repeat procedure for each cage.

LO Temp Shutdown Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to power control board, -4.7 V power adjust panels, and 400-Hz power control box (figure 6-2) when performing this procedure.

1. Insert piece of paper between reflector and photo diode located on the water inlet. BACK UP LO TEMP FAULT LED lights and approximately three minutes later all four -4.7 V circuit breakers on power adjust panels trip, -2.2 V circuit breaker on 400-Hz power control box trips, and CKT BRKR OFF LED lights.

2. Remove paper from reflector. BACK UP LO TEMP FAULT and CKT BRKR OFF LEDs on power control board stay lit.

3. Press and release RESET/RESTART switch on power control board. BACK UP LO TEMP FAULT LED goes out and CKT BRKR OFF fault stays lit.

4. Reset circuit breakers.

5. Press and release RESET/RESTART switch again. CKT BRKR OFF fault LEDs go off.

Cable Fault Shutdown Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to power control board, -4.7 V power adjust panels, and 400-Hz power control box (figure 6-2) when performing this procedure.

WARNING

High voltage present. To avoid possible injury remove power before performing procedure.

1. Remove power by setting circuit breaker on 400-Hz power control box to OFF.

2. Remove four screws from top and bottom of -4.7 V power breaker panel (figure 6-8) and swing panel open.

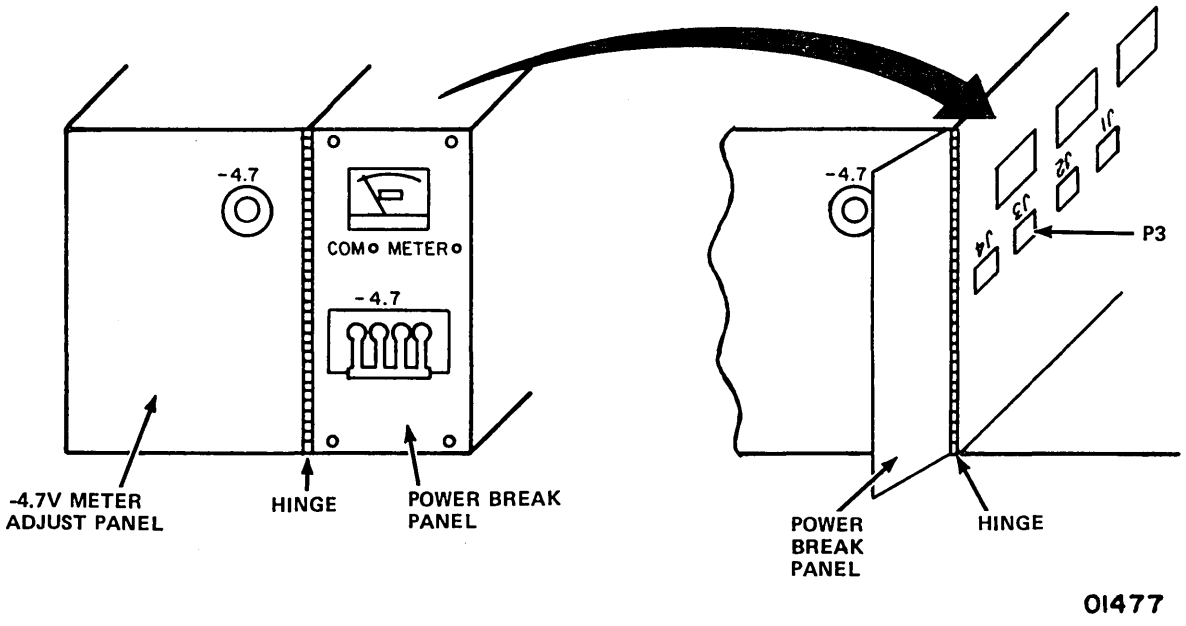


Figure 6-8. Cable Fault P3 Location (Right-Hand View)

NOTE

Left-hand view of -4.7 V power adjust panel is a mirror image of right-hand view.

3. Unplug white connector P3 from J3. Connector P3 is located behind power breaker panel and is next to the red connector P2/J2.

4. Apply power by setting 400-Hz circuit breaker to ON. CA FAULT LED on power control board lights.

5. Set 400-Hz circuit breaker to OFF.

6. Replug connector P3. CA FAULT LED goes off.

7. Replace screws on -4.7 V power adjust panel.

8. Set 400-Hz circuit breaker to ON.

9. Press and release RESET/RESTART switch on power control board. Power is restored.

CKT BRKR Off Fault Shutdown Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to power control board, -4.7 V power adjust panels, and 400-Hz power control box (figure 6-2) when performing this procedure.

1. With power applied, set circuit breaker on -4.7 V power adjust panel to OFF. Power is immediately removed and CKT BRKR OFF fault LED on power control board lights.

NOTE

An overvoltage caused by setting the -4.7 V circuit breaker off may cause the other circuit breakers to trip off.

2. Reset circuit breaker. CKT BRKR OFF fault LED stays lit.

3. Press and release RESET/RESTART switch on power control board. CKT BRKR OFF LED goes out.

4. Repeat procedure for each remaining -4.7 V circuit breaker.

Long/Short Warning Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to column power distribution box, low-temperature sensor assembly, and SPM Front Panel Controls and Indicators (figures 6-1, 6-2, and 6-3) when performing this procedure.

1. Load maintenance software tape CMSE.

2. Insert piece of paper between dewpoint reflector and photo diode on CM. BACK UP LOW TEMP fault LED on power control board lights, Long Warning bit in CPU sets (CPU Reg 00 bit 63) and correct COLUMN FAULT LED on SPM lights.

3. Monitor CPU Reg 00. Approximately 1.5 minutes after fault is detected, CPU Short Warning bit sets (CPU Reg 00 bit 59), approximately 2.5 seconds later CM power is removed, and correct COLUMN FAULT LED on SPM goes off.

4. Remove paper between diode and reflector.

5. Press and release RESET/RESTART switch on power control board. CM power is restored.

6. Repeat this procedure on optional CM.

OV/OC Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to TCVP board and power control board (figure 6-2) when performing this procedure.

NOTE

To save maintenance time, perform this procedure in conjunction with the High Temperature Fault Check in this section.

1. Remove two top screws securing TCVP board to top cage.
2. Pull TCVP board out far enough to gain access to left-hand connectors.
3. Unplug left rear connector J3 on TCVP board. All four circuit breakers on -4.7 V power adjust panels trip, -2.2 V circuit breaker on 400-Hz power control box trips, all four I-FAULT AND V-FAULT LEDs on TCVP board light, and PS fault and CKT BRKR OFF LEDs on power control board light.
4. Repeatedly press and release RESET/RESTART switch on power control board while listening for an audible click from each -4.7 V power adjust panel and the 400-Hz power control box. (The click indicates that the four pole, normally closed, contactors momentarily deenergize).
5. Replug connector J3 on TCVP board. All four I-FAULT AND V-FAULT LEDs on TCVP board and PS fault and CKT BRKR OFF LEDs on power control board stay lit.
6. Replace TCVP board.
7. Press and release RESET/RESTART switch. PS FAULT and all four I-FAULT AND V-FAULT LEDs go off.
8. Set 400-Hz circuit breaker to OFF.
9. Set -2.2 V and -4.7 V DISCONNECT circuit breakers to ON.
10. Set 400-Hz circuit breaker to ON.
11. Press and release RESET/RESTART switch again. CKT BRKR OFF fault LEDs go off.
12. Repeat procedure for each TCVP board.

PRI LO Temp Fault Shutdown Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to power control board (figure 6-2) when performing this procedure.

1. With power on (normal mode), apply freon to low temperature thermistor located on input water line. PRI LO TEMP FAULT LED on power control board lights and one minute later, power is removed.

NOTE

Periodically spray freon on thermistor after LED activates to ensure that fault condition does not clear.

2. Apply heat to thermistor with palm of hand. Fault LED stays lit.

3. Press and release RESET/RESTART switch on power control board. Fault LED goes off and power is restored.

Thermostat Check (BS174-A/BS175-A)

This procedure is performed on the central memory cabinet. Refer to 400-Hz power control box (figure 6-2) when performing this procedure.

1. Locate back-up thermostat mounted on vertical output pipe at rear of column (approximately 30-inches from bottom).

2. Using heat gun, apply heat to thermostat. 400-Hz circuit breaker on 400-Hz power control box trips when temperature reaches 39.4 °C (103 °F).

3. Remove heat from thermostat.

4. Allow thermostat to cool and reset 400-Hz circuit breaker.

Cable Fault Check (LSI/ZIF)

This procedure is performed on the LSI and ZIF CPU columns. Refer to column power distribution box (figures 6-4 and 6-5) when performing this procedure.

1. With column power on, unplug thermistor connector plug on right side of temperature-protect board at top cage. Power is immediately removed and CABLE FAULT LED on column power distribution box lights.

2. Replug thermistor jumper plug.

3. Press and release RESET switch on column power distribution box. Column power is restored.

Column PWR Supply Off Fault Check (LSI)

This procedure is performed on the LSI and ZIF CPU columns. Refer to column power distribution box (figure 6-5) when performing this procedure.

1. Set 2.2-V DISCONNECT circuit breaker on column power distribution box to OFF. POWER ON LED goes out and POWER SUPPLY OFF LED lights.
2. Set 2.2-V DISCONNECT circuit breaker to ON.
3. Press and release RESET switch. Power is restored and LEDs go off.
4. Repeat steps 1 through 3 for 4.7-V DISCONNECT circuit breaker.
5. Repeat procedure for each column.

Column Thermistor Temperature-Protect Fault Check (LSI/ZIF/CMC)

This check ensures that the power control board shuts off logic power when a high temperature fault signal is sensed. The five primary thermistors are on the connector end nearest the column front. The back-up thermistors are on the connector end toward the column rear. Refer to column power components and column power distribution box (figures 6-4 and 6-5), and temperature-protect board indicators (figure 2-4) when performing this check.

1. With column power on, observe that all fault LEDs on column power distribution box are clear.
2. Locate top temperature-protect board for column (Panel A).
3. Remove two screws from cover plates of temperature-protect board and -2.2 V regulator.
4. Partially disconnect thermistor connector J2 (end nearest column front on left-hand side) until a PRIMARY HIGH TEMP LED lights. Power is removed 15 seconds later and PRIMARY HIGH TEMP LED on column power distribution box lights.
5. Completely disconnect J2 from temperature-protect board. Three seconds later BACK UP HIGH TEMP LED on power distribution box lights and 2.2-V and 4.7-V DISCONNECT circuit breakers trip.
6. Disconnect remaining three thermistor connectors for panels B, C, and D.
7. Press and release RESET switch on column power distribution box. All ten primary and back up high temp LEDs on each temperature-protect board light.
8. Reconnect four J2 thermistor connectors.
9. Press and release RESET switch. All fault LEDs go off.
10. Reset 2.2-V and 4.7-V DISCONNECT circuit breakers.
11. Press and release RESET switch again.
12. Repeat procedure for remaining CPU and CMC columns.

Column 2.2-V/4.7-V Adjustment and Percent Meter Calibration (LSI)

This procedure is performed on the LSI CPU columns. Refer to column power distribution box (figure 6-5) when performing this procedure.

1. With column power on, set meter select switch on column power distribution box to 4.7-V.

2. Set digital multimeter to a scale that measures 2 to 5 V dc.

3. Connect multimeter test leads to + (red) and - (blue) test points below percentage meter.

4. Mechanically zero percentage meter indicator, if necessary, as follows:

   a. Set meter select switch to OFF.

   b. Turn screw on front of percentage meter to align meter indicator at mechanical zero mark at far left of scale.

5. Set meter select switch on power distribution box to 2.2-V.

6. Adjust percentage meter for -2.2 V power supply as follows:

   a. Set meter select switch to 2.2-V.

NOTE

In some instances the 2.2-V DISCONNECT circuit breaker trips to OFF before multimeter indicates -2.85-V dc. This may happen because of an electrical characteristic of the 2.2-V adjustment control.

   b. Slowly turn 2.2-V adjust knob until meter indicates -2.85 V dc.

   c. If necessary, adjust meter to zero percent by adjusting 2.2-V METER ADJ screw at top of power distribution box as follows:

      (1) Remove two retaining screws from lower front corners of column power distribution box.

      (2) Slide column power distribution box outward from column.

      (3) Adjust meter using nonmetallic POT adjustment screwdriver.

7. Adjust percentage meter for -4.7 V power supply as follows:

   a. Set meter select switch to 4.7-V.

   b. Slowly turn 4.7-V adjust knob until multimeter indicates 4.8-V dc.

c. If necessary, adjust meter to zero percent by adjusting 4.7-V METER ADJ screw at top of power distribution box as follows:

(1) Remove two retaining screws from lower front corners of column power distribution box.

(2) Slide column power distribution box outward from column.

(3) Adjust meter using nonmetallic POT adjustment screwdriver.

8. Replace column power distribution box.

9. Repeat procedure for each column.

Diode Heat Sink High Temp Back-up Check (LSI)

This procedure is performed on the LSI CPU columns. Refer to column power distribution box (figure 6-5) when performing this procedure.

1. Remove six screws from transformer protective screen and backplate located at rear of column.

2. Remove backplate and screen.

3. Using wire or meter lead, short terminal 7 to terminal 8 of TB3 (TB3 is located at the top of the 4.7-V transformer at the rear of the column). 400-Hz DISCONNECT circuit breaker on column power distribution box trips.

4. Remove wire from TB3 terminals 7 and 8.

5. Replace protective screen and backplate.

6. Reset 400-Hz DISCONNECT circuit breaker.

Long/Short Warning Check (CPU)

This procedure is performed on the LSI CPU columns. Refer to column power distribution box (figure 6-5), SPM Front Panel Controls and Indicators (figure 6-1), and low-temperature sensor assembly (figure 6-6) when performing this procedure.

1. Load maintenance software tape CMSE.

2. Insert piece of paper between dewpoint reflector and photo diode on CPU Chassis 1 column 1. BACK UP LOW TEMP fault LED on column power distribution box lights, Long Warning bit sets in CPU Reg 00 bit 63, and correct COLUMN FAULT LED on SPM lights.

3. Monitor CPU Reg 00. Approximately one minute after fault is detected, CPU Short Warning bit sets (CPU reg 00 bit 59), approximately three seconds later CPU power is removed and correct COLUMN FAULT LED on SPM goes off.

4. Remove paper between diode and reflector.

5. Press and release RESET switch on column power distribution box. CPU column power is restored.

6. Repeat this procedure for all CPU and CMC columns.

Regulator Cable Fault Check (LSI)

This procedure is performed on the LSI CPU columns. Refer to column power components and column power distribution box (figures 6-4 and 6-5) when performing this procedure.

1. Disconnect cable connectors in cable running between regulator board and temperature-protect board, located on left side of LSI panel. CABLE FAULT LED on column power distribution box lights and power is removed.

2. Reconnect cable connectors.

3. Press and release RESET switch on column power distribution box. CABLE fault clears.

4. Repeat procedure on remaining three regulators.

5. Repeat procedure for remaining columns.

System Warning Check

This procedure is performed on the LSI CPU columns. Refer to column power distribution box (figure 6-5) when performing this procedure.

1. Load maintenance software tape CMSE.

2. Turn 2.2-V adjust knob for any one of CPU columns to slightly above, then below, 10%. SPM warning horn sounds. IOU and CPU Reg 00 bits 63 set when fault activates.

3. Adjust voltage to nominal (0% on meter). Warning bits clear.

Transient Check

This procedure is performed on the LSI CPU columns. Refer to column power distribution box (figure 6-5) when performing this procedure.

1. With column power applied, press and release TEST switch on column power distribution box. 2.2-V and 4.7-V DISCONNECT circuit breakers trip and 2.2-V FAULT and 4.7-V FAULT LEDs light.

2. Press and release RESET switch. POWER SUPPLY OFF LED lights.

3. Alternately press and release RESET and TEST switches while listening for an audible click indicating that K2 deenergizes.

4. Set 400-Hz DISCONNECT circuit breaker to OFF.

5. Reset 2.2-V and 4.7-V DISCONNECT circuit breakers.

6. Set 400-Hz DISCONNECT circuit breaker to ON.

7. Press and release RESET switch. Column power is restored.

Low Temperature Fault/Adjustment

This procedure is performed on the low temperature sensor assembly located near the chassis water temperature gauge sensing bulb on the GH252-A, beneath the modulator motor on the GH251-C, and on the chassis columns near the chassis inlet. Refer to figures 6-3, 6-6, 6-6.1, and 6-7 (as applicable) when performing this procedure.

1. If performing this procedure on CPU or CMC columns continue with procedure, if not, skip to step 3.

2. Remove two retaining screws from column power distribution box and slide out.

3. With power applied, insert a piece of paper between light source and reflector on low-temperature sensor assembly on column or cooling unit. The following conditions result and last until removal of paper:

NOTE

Remove paper from low-temperature sensor assembly before 120 seconds to prevent an automatic shut-off of column power.

CPU/CMC - Horn sounds and COLUMN FAULT LED lights on SPM. BACK UP LOW TEMP indicator on top of power distribution box lights.

CM - Horn sounds and COLUMN FAULT indicator lights on SPM. LO TEMP FAULT indicator on CM power control board lights.

NOTE

Remove paper from low-temperature sensor assembly before ten seconds to prevent an automatic shut-off of cooling unit power.

Water-Cooling Unit	Horn sounds and CHILLER ON indicator lights on SPM.	LOW TEMP fault indicator on water cooling unit lights immediately.

4. Check low-temperature sensor voltage and, if necessary, adjust it as follows:

   a. Set multimeter to a scale that measures 9 to 10-V dc.

NOTE

Place multimeter leads lightly on TB1 to prevent bending of the low-temperature assembly on a possible erroneous reading.

   b. Place meter negative (-) lead on low-temperature sensor TB1-1 and positive lead (+) on TB1-3.

   c. Observe multimeter reading from 9.9 to 10.1 V dc. If voltage is not within this range, correct it by adjusting potentiometer on low-temperature assembly.

   d. Remove multimeter leads from TB1.

5. Replace column power distribution box, if necessary.

FIELD REMOVAL AND REPLACEMENT PROCEDURES

Removal and Replacement procedures for AD112-C/AD113-A, AD115/AD116-A, AD115/AD116-B, and AD118-A are provided for the following components:

Buck-Boost Transformer Removal/Replacement - 7CX00006-B (AD118-A only)

Chassis Column PD Box Corrective Maintenance - 7CX00037-B (AD118-A only)

Chassis Column PD Box Removal/Replacement - 7CX00003-B

Chassis Column Power Removal/Application - 7CX00009-B

Chassis Column Power Supply Diode Removal/Replacement - 7CX00004-B

Chassis Column Power Supply SCR Removal/Replacement - 7CX00005-B

Chassis Column Thermistor Removal/Replacement - 7CX00029-B

Chassis Column Thermostat Removal/Replacement - 7CX00076-B

BS174-A/BS175-A High Temperature Thermistor Removal/Replacement - 7CX00086-A

Chassis Column 3-V Transformer Removal/Replacement - 7CX00001-B

Chassis Column 5-V Transformer Removal/Replacement - 7CX00002-B

LSI Panel Current Regulator Removal/Replacement - 7CX00017-B

LSI Temperature-Protect Board Removal/Replacement - 7CX00021-B

Power Multiplexer Board Removal/Replacement - 7CX00019-B (AD118-A only)

ZIF Temperature-Protect Board Removal/Replacement (A) - 7CX00040-B (AD118-A Serial Numbers 101 and 102)

ZIF Temperature-Protect Board Removal/Replacement (B) - 7CX00033-B (AD118-A Serial Number 103 and up)

Buck-Boost Transformer Removal/Replacement - 7CX00006-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
Local supply	Drive socket wrench
Local supply	3/8-in socket for socket wrench
Local supply	3/8-in open-end wrench
Local supply	7/16-in open-end wrench with long handle

References

This procedure references the following procedure:

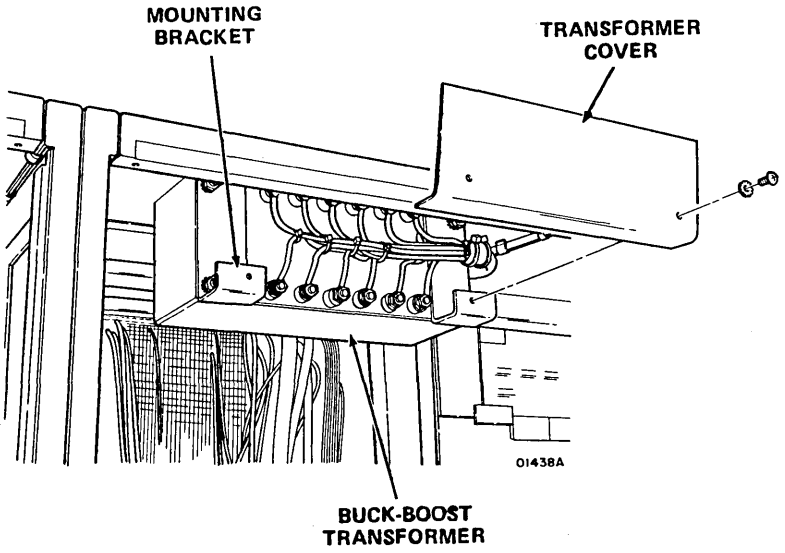
7CX00009 Chassis Column Power Removal/Application

Introduction

The buck-boost transformer multiplies the current-handling ability of the 4.7-V adjustable autotransformer in the power distribution box in chassis column 1 of the CYBERPLUS processor. The transformer mounts to the top of the column at the back of column 2 of each processor.

Removal

1. Remove power from chassis columns 1 and 2 according to Procedure 7CX00009, Chassis Column Power Removal/Application.



Buck Boost Transformer

2. Remove externally supplied 400-Hz power from columns 1 and 2 by setting 400-Hz circuit breakers on wall-mounted power panel to OFF.

3. Remove transformer cover from mounting brackets by removing two screws, nuts, and lockwashers.

4. Remove transformer cable strain relief from upper right corner of chassis.

NOTE

Label wire connections to transformer terminals for later replacement.

5. Disconnect wires from transformer terminals. Use drive socket wrench with 3/8-in socket for lower terminals and 3/8-in open-end wrench for upper terminals.

WARNING

The buck-boost transformer weighs about 8 kg (18 lb).

6. Remove transformer from mounting brackets by removing four nuts and lockwashers. Use 7/16-in wrench open-end wrench with long handle.

Replacement

1. Temporarily mount upper two mounting posts of transformer to lower two holes of mounting brackets. (This makes replacing upper wires easier.)

2. Replace wires on transformer terminals.

3. Remove transformer from lower two holes of mounting brackets, and mount in all four holes of mounting brackets.

4. Replace cable strain relief on chassis.

5. Replace transformer cover on mounting brackets with two screws, nuts, and lockwashers.

Chassis Column PD Box Corrective Maintenance - 7CX00037-B

Required Items:

The following items are required for this procedure:

Part Number	Item
Local supply	Flat-blade screwdriver
Local supply	Phillips screwdriver
Local supply	1/4-in drive socket set
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag

References

This procedure references the following procedures:

7CX00009 Chassis Column Power Removal/Application
7CX00003 Chassis Column PD Box Removal/Replacement
7CX00012 Static Sensitive Parts Handling

Introduction

Although most assemblies and parts in the power distribution (PD) box are field replaceable, they are not field repairable. For ease of servicing, remove PD box from the chassis column and bring it to a work station for repair.

Removal

1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Remove PD box from chassis column according to Procedure 7CX00003, Chassis Column PD Box Removal/Replacement.

CAUTION

Observe antistatic precautions when servicing the Power Control Board assembly.

3. All service replaceable parts in the PD box employ conventional maintenance techniques, and do not require individual procedures.

Replacement

Replacement consists of reversing removal procedure.

Chassis Column PD Box Removal/Replacement - 7CX00003-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
Local supply	Flat-blade screwdriver
Local supply	Ratchet wrench
Local supply	5/16-in socket
Local supply	5/16-in combination wrench

References

This procedure references the following procedure:

7CX00009 Chassis Column Power Removal/Application

Introduction

The chassis column power distribution (PD) box is located at the bottom of the column, and is accessed from the front of the column. The PD box distributes 400-Hz power to the 3-V and 5-V transformers. In addition to a main 400-Hz circuit breaker, the PD box has breakers for the individual voltages, as well as variacs and meters used to adjust the voltages. The PD box also contains column fault detection and warning circuitry.

Removal

1. Remove power from chassis column containing PD box according to Procedure 7CX00009, Chassis Column Power Removal/Application.

WARNING

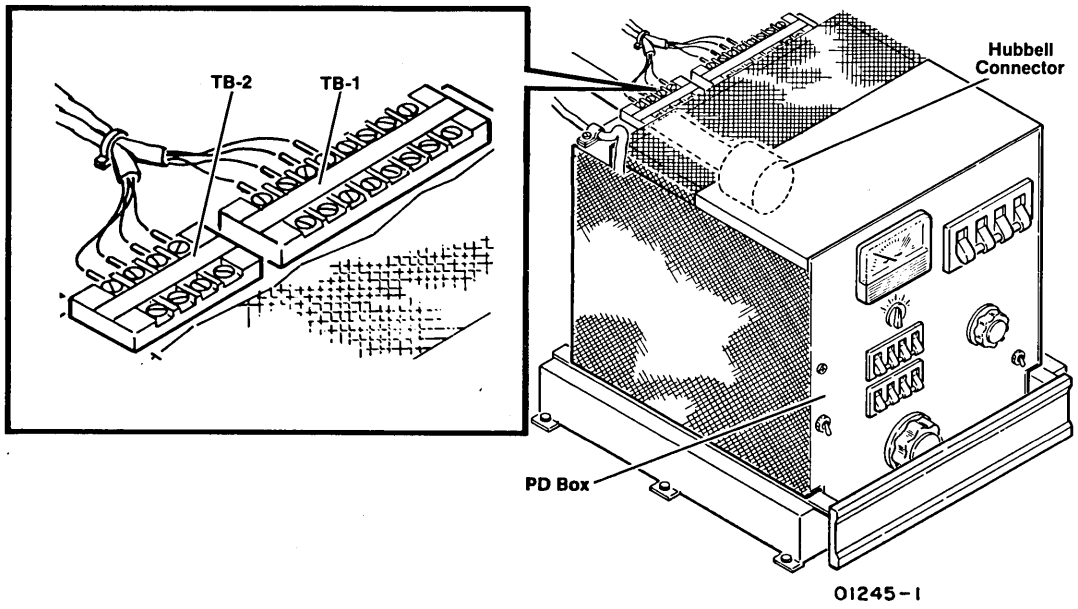
When servicing or removing the PD box, both 400-Hz and 60-Hz power must be removed at the wall box.

2. Remove two screws from lower corners of PD box mounting tray. Slide PD box out until it catches.

3. Unplug Hubbell ac connector from back of PD box.

4. Remove four screws holding top perforated cover on PD box. Remove cover.

5. Label wires to TB1 and TB2 on top rear of PD box for later replacement. Disconnect leads to TB1 and TB2. Remove cable clamp to left of TB1.

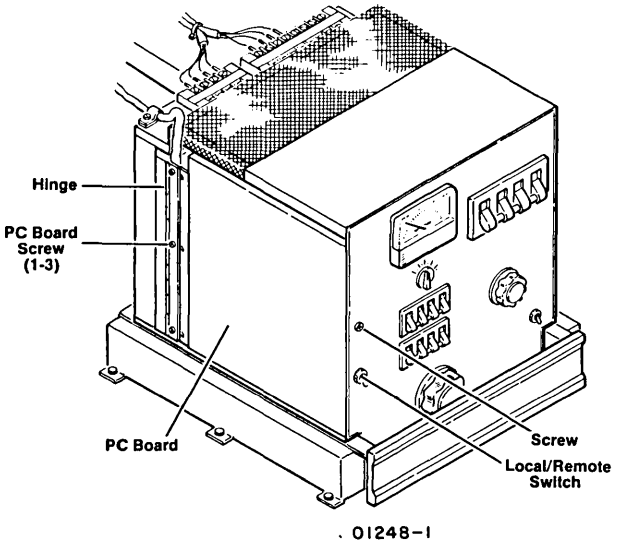


PD Box and Terminal Strips

6. Remove nine screws in PD box left cover. Remove cover.

7. Remove screw located just above LOCAL/REMOTE switch on left front panel of PD box.

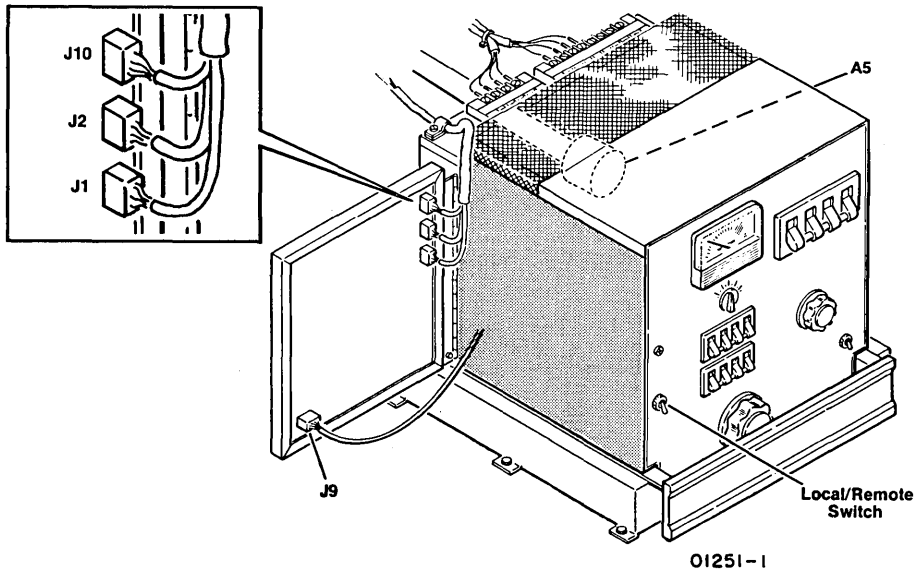
8. Loosen three screws holding power control (PC) board to hinge. Slide board to rear of PD box until LOCAL/REMOTE switch clears hole in front panel of PD box.



PD Box Left Side (Cover Removed)

9. Swing out PC board assembly.

10. Unplug J1, J2, J9, and J10 from PC board assembly.

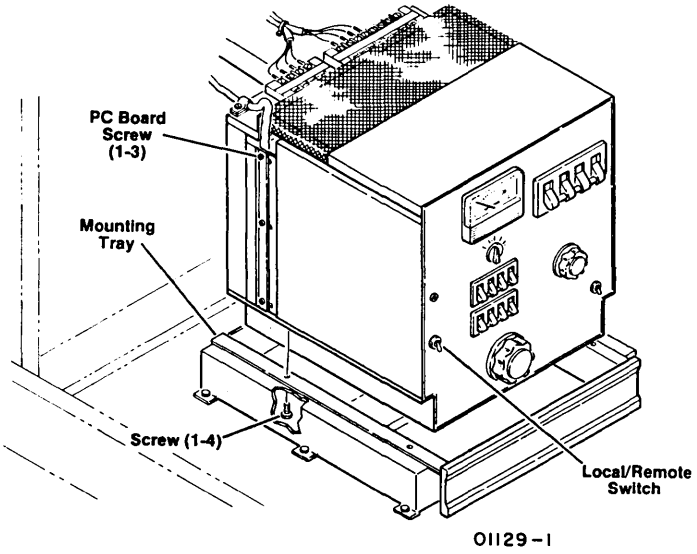


PD Box Plug Locations

CAUTION

To prevent damage to PC board, swing board back in after removing plugs, and insert retaining screw through PD box front panel.

11. Remove four screws holding PD box to mounting tray, using ratchet wrench and 5/16-in socket for outer screws, and 5/16-in combination wrench for inner screws.



PD Box and Mounting Tray

Removal/Replacement

WARNING

PD box weighs more than 18 kg (40 lbs), and requires two persons to lift it.

12. Lift PD box out of mounting tray.

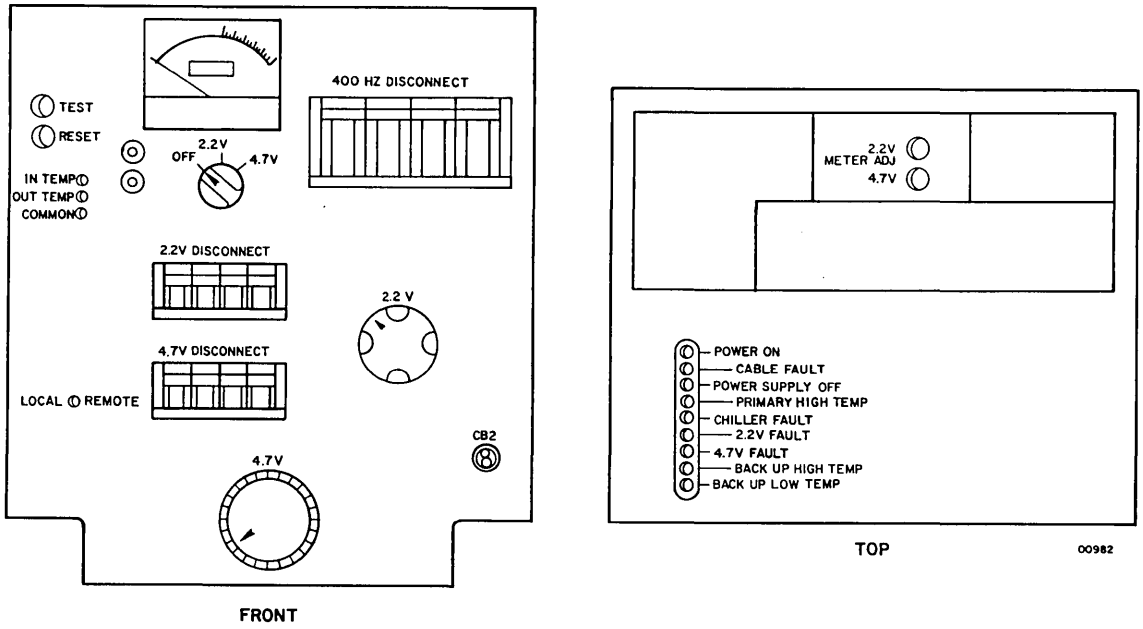
Replacement

Replacement consists of reversing removal procedure.

Chassis Column Power Removal/Application - 7CX00009-B

Introduction

Before replacing components mounted in a chassis column, you must remove power from the column. Power controls are located on the power distribution (PD) box at the base of each column. Use the following procedures to remove and apply power in a chassis column.



Power Distribution Box Controls and Indicators

Removing Power

1. Set LOCAL/REMOTE switch to LOCAL.
2. Set 400-Hz DISCONNECT circuit breaker to OFF.

Applying Power

1. Set LOCAL/REMOTE switch to LOCAL.
2. Set 400-Hz DISCONNECT circuit breaker to ON. Observe that POWER SUPPLY OFF indicator on PD box is on and that all other PD box indicators are off. If chassis column contains LSI panels, observe that PW (power) LED on regulator board (below each panel assembly) is on.
3. If POWER SUPPLY OFF indicator is on, press RESET switch. POWER SUPPLY OFF indicator goes off and POWER ON indicator on top of PD box lights.
4. If required by site, set LOCAL/REMOTE switch to REMOTE.

Chassis Column Power Supply Diode Removal/Replacement - 7CX00004-B

Required Items

The following items are required to perform this procedure:

Part Number	Item
Local supply	Phillips screwdriver
Local supply	Flat-blade screwdriver
Local supply	Ratchet wrench
Local supply	6-in extender
Local supply	12-in extender
Local supply	1-1/16-in 10-point crowfoot wrench
Local supply	1-1/4-in 10-point crowfoot wrench
12263227	Modified deep socket (1-1/16-in)
12263442	Modified deep socket (1-1/4-in)
95657900	Thermal grease (GE 641)
12205640	Torque wrench (1000 lbf•in)

References

This procedure references the following procedures:

7CX00009	Chassis Column Power Removal/Application
7CX00003	Chassis Column PD Box Removal/Replacement
7CX00001	Chassis Column 3-V Transformer Removal/Replacement
7CX00002	Chassis Column 5-V Transformer Removal/Replacement
7CX00005	Chassis Column Power Supply SCR Removal/Replacement

Introduction

Two groups of power diodes rectify 400-Hz voltages from two power supply transformers in each chassis column. Diode groups and their related power supplies are:

CR1-CR12	5-V 300-A Diodes
CR13-CR24	3-V 150-A Diodes

Removal

1. Remove power from chassis column containing faulty diode according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Provide access to diode to be removed. For CR1-CR12, go to step 3. For CR13-CR24, remove PD box according to Procedure 7CX00003, Chassis Column PD Box Removal/Replacement.

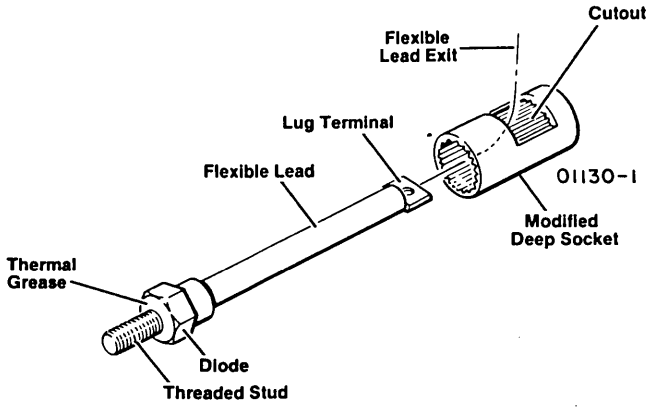
3. Disconnect and remove parts, such as power buses, that restrict removal of power diode. Determining which parts must be removed will be obvious and will vary depending on diode to be removed. If transformer or SCR must be removed, refer to appropriate procedure listed under REFERENCES.

4. Disconnect diode lead from transformer terminal.

5. Remove diode using applicable substep:

    a. CR1-CR12 use ratchet wrench with 12-in extender and modified 1-1/4-in socket or 1-1/4-in 10-point crowfoot wrench.

    b. CR13-CR24 use ratchet wrench with 6-in extender and modified 1-1/16-in socket or 1-1/16-in 10-point crowfoot wrench.



Modified Deep Socket for Diode Removal

Replacement

1. Apply thin coating of GE 641 thermal grease to base of diode.

2. Screw diode into heat sink by hand.

3. Tighten diode using applicable substep:

    a. CR13 through CR24 use torque wrench with 6-in extender and a 1-1/16-in modified deep socket or 1-1/16-in 10-point crowfoot wrench, torque to 17-20 N•m (150-180 lbf•in).

    b. CR1 through CR12 use torque wrench with 12-in extender and a 1-1/4-in modified deep socket or 1-1/4-in 10-point crowfoot wrench, torque to 27-34 N•m (240-300 lbf•in).

4. Connect diode lead to transformer terminal.

5. Replace any parts disconnected during removal.

6. Apply power to chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

Chassis Column Power Supply SCR Removal/Replacement - 7CX00005-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	12-in adjustable wrench
Local supply	Ratchet wrench
Local supply	1/2-in socket
Local supply	3/8-in socket
Local supply	1/2-in combination wrench
Local supply	3/8-in combination wrench
Local supply	1-1/16-in combination wrench
Local supply	1-1/8-in combination wrench
Local supply	1-3/4-in crowfoot wrench
95657900	Thermal grease (GE 641)
12205640	Torque wrench (1000 lbf•in)

References

This procedure references the following procedures:

7CX00009 Chassis Column Power Removal/Application
7CX00002 Chassis Column 5-V Transformer Removal/Replacement

Introduction

Two silicon-controlled rectifiers (SCRs) provide transient protection for the CP logic circuits from potentially harmful voltage or current overloads. During an overload, the SCRs instantly short their associated power busses to ground while slower reacting contactors remove power from the voltage bus. The SCRs are accessible from the rear of the cabinet.

Removal

1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Remove transformer cover according to Procedure 7CX00002, Chassis Column 5-V Transformer Removal/Replacement.

3. Remove SCR control wires (red and white twisted pair) from TB3 on upper transformer bracket according to applicable substep:

    a. SCR1, TB3-1, 2

    b. SCR2, TB3-9, 10

4. Disconnect SCR flexible power lead from power bus by removing bolt and nut according to applicable substep:

    a. SCR1 use ratchet wrench, 1/2-in socket, and 1/2-in combination wrench.

    b. SCR2 use ratchet wrench, 3/8-in socket, and 3/8-in combination wrench.

5. Loosen and remove locking nut from SCR with 1-1/16-in combination wrench. Use adjustable wrench on SCR to prevent it from turning.

6. Remove mounting nut from stud bolt using a 1-1/8-in combination wrench.

7. Remove SCR.

Replacement

1. Apply thin coating of GE 641 thermal grease to base of SCR.

2. Insert SCR through hole in heat sink and screw mounting nut onto stud bolt by hand.

3. Hold nut with 1-1/8-in combination wrench while using torque wrench and a 1-3/4-in crowfoot wrench to tighten SCR to 34-39 N•m (300-360 lbf•in).

4. Connect SCR flexible power lead to power bus using applicable substep:

    a. SCR1 tighten 1/2-in nut to 14 N•m (120 lbf•in).

    b. SCR2 tighten 3/8-in nut to 8 N•m (68 lbf•in).

5. Connect SCR control wires (red and white twisted pair) to TB3 on upper transformer bracket using applicable substep:

    a. SCR1, TB3-1 white, TB3-2 red.

    b. SCR2, TB3-9 white, TB3-10 red.

6. Replace transformer cover.

7. Apply power according to Procedure 7CX00009, Chassis Column Power Removal/Application.

Chassis Column Thermistor Removal/Replacement - 7CX00029-B

Required Items

Part Number	Item
Local supply	Diagonal cutting pliers
Local supply	Steel wool
95657900	Thermal grease (GE 641)
95558020	Copper foil tape
12210948	Black vinyl tape
52855300	Insul grease
Local supply	Cable ties

References

This procedure references the following procedures:

7CX00009	Chassis Column Power Removal/Application
7CX00008	LSI Panel Removal/Replacement
7CX00030	ZIF Cold Plate Assembly "B" Removal/Replacement
7CX00038	ZIF Cold Plate Assembly "A" Removal/Replacement

Introduction

Primary and back-up thermistors sense the temperature of the coolant tubes of the ZIF cages, LSI panel assemblies, and chassis column input and output. Because of the techniques used in mounting the thermistors, they are not readily visible. All thermistors can be located by tracing their yellow wires from the temperature-protect board (located directly above the cage or panel assembly).

Three kinds of thermistors are used: tie-on, clip-on, and screw-in. Removal and replacement procedures are given for all three types. After determining which type to replace, use the appropriate section of this procedure.

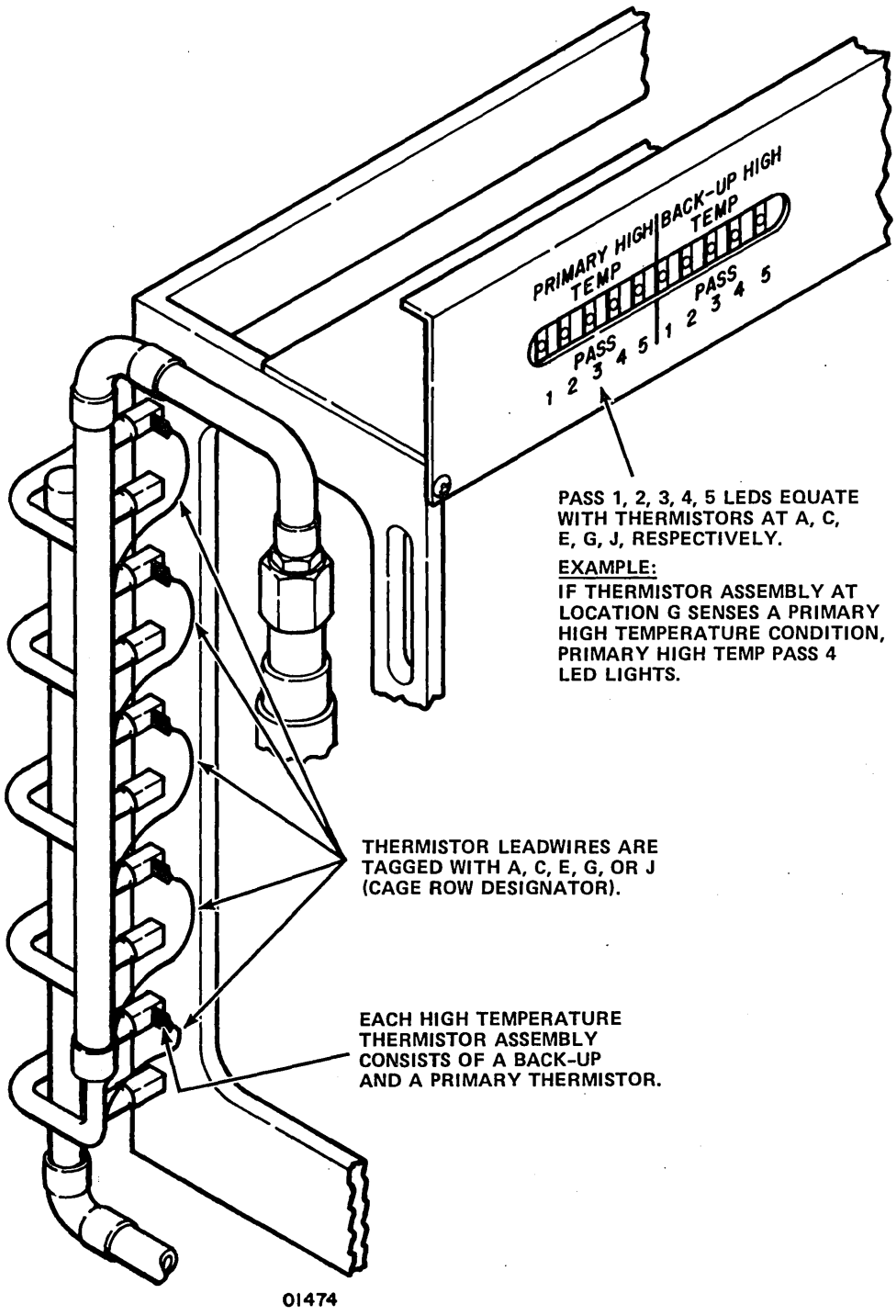
Tie-On Thermistor Removal

1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Provide access to thermistor as determined by its location.

   a. If a thermistor is mounted on an LSI panel assembly, it may be necessary to remove panel assembly according to Procedure 7CX00008, LSI Panel Removal/Replacement.

   b. If a thermistor is mounted on a ZIF cold plate assembly, it may be necessary to remove assembly according to Procedure 7CX00030, ZIF Cold Plate Assembly "B" Removal/Replacement, or Procedure 7CX00038, ZIF Cold Plate Assembly "A" Removal/Replacement.



LSI-ZIF Cage High Temperature Thermistor/LED Locations

WARNING

Place a finger against the cable tie before cutting to prevent it from snapping and causing injury.

3. Cut any cable ties holding thermistor and wires to coolant tube.

4. Remove electrical and copper foil tape holding thermistor to coolant tube.

5. Slide large insulating sleeve away from thermistor to expose its two soldered connections.

NOTE

An inspection of the soldered connections may reveal an open connection rather than a defective thermistor. An open thermistor circuit causes a low temperature fault. A shorted thermistor causes a high temperature fault.

6. Unsolder thermistor from connector wires.

7. Remove small insulating sleeves from thermistor wires.

Tie-On Thermistor Replacement

1. Place small insulating sleeves on thermistor wires.

2. Cut thermistor wires beyond ends of insulating sleeves at points that will permit solder connections to wires.

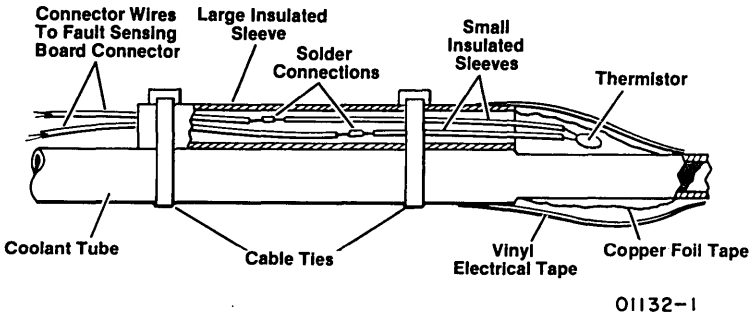
3. Solder thermistor wires to wires from temperature-protect board connector. A thermistor wire does not have polarity and therefore may connect to either wire from fault sensing board.

4. Slide large insulating sleeve over solder connections.

5. Place thermistor in contact with coolant tube and fasten with one to two wraps of copper foil tape.

6. Strengthen thermistor installation by wrapping vinyl electrical tape over copper foil tape.

7. Fasten thermistors and wires to coolant tube with new cable ties.



Thermistor Installation

8. Install LSI panel assembly or ZIF cage cold plate assembly, if previously removed. Perform replacement procedure for appropriate assembly.

9. Apply power to column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

10. Observe fault indicators on power distribution (PD) box and system power monitor (SPM) for column just serviced. No fault indicators should be lit. Correct any fault.

Clip-On Thermistor Removal

1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Provide access to thermistor as determined by its location.

   a. If a thermistor is mounted on an LSI panel assembly, it may be necessary to remove panel assembly according to Procedure 7CX00008, LSI Panel Removal/Replacement.

   b. If a thermistor is mounted on a ZIF cold plate assembly, it may be necessary to remove assembly according to Procedure 7CX00030, ZIF Cold Plate Assembly "B" Removal/Replacement, or Procedure 7CX00038, ZIF Cold Plate Assembly "A" Removal/Replacement.

WARNING

Place a finger against the cable tie before cutting to prevent it from snapping and causing injury.

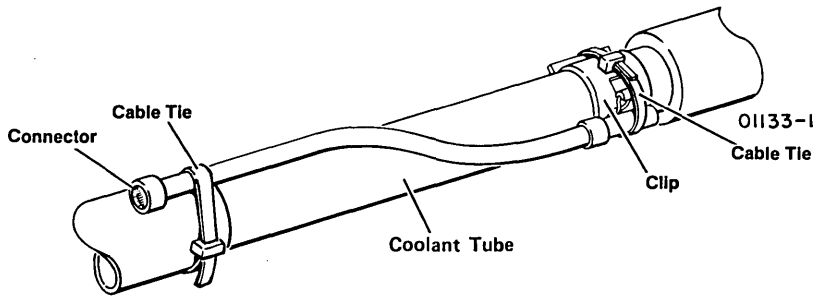
3. Cut cable ties that hold thermistor and wires to coolant tube.

4. Unplug connector for faulty thermistor.

5. Remove thermistor clip assembly from tube.

Clip-On Thermistor Replacement

1. Clean coolant tube with steel wool where clip will attach.
2. Apply Insul grease to cleaned area of coolant tube.
3. Attach clip assembly with thermistor to tube.
4. Plug in connector to wiring harness.
5. Fasten assembly and connector to tube with new cable ties.



Coolant Tube and Thermistor Clip Assembly

6. Apply power to column according to Procedure 7CX00009, Chassis Column Power Removal/Application.
7. Observe fault indicators on PD box and SPM for column just serviced. No fault indicators should be lit. Correct any fault.

Screw-In Thermistor Removal

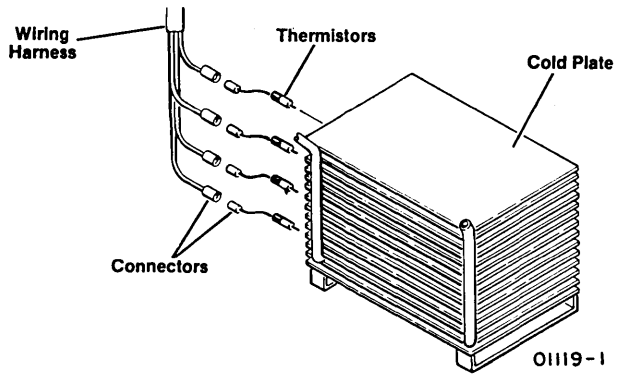
1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.
2. Provide access to thermistor as determined by its location.
   a. If a thermistor is mounted on an LSI panel assembly, it may be necessary to remove panel assembly according to Procedure 7CX00008, LSI Panel Removal/Replacement.
   b. If a thermistor is mounted on a ZIF cold plate assembly, it may be necessary to remove assembly according to Procedure 7CX00030, ZIF Cold Plate Assembly "B" Removal/Replacement, or Procedure 7CX00038, ZIF Cold Plate Assembly "A" Removal/Replacement.

WARNING

Place a finger against the cable tie before cutting to prevent it from snapping and causing injury.

3. Cut any cable ties holding thermistor wires to coolant tube.

4. Unplug connector for faulty thermistor.



Cold Plate and Thermistors

5. Unscrew thermistor from cold plate.

Screw-In Thermistor Replacement

1. Squeeze GE 641 thermal grease into thermistor hole in cold plate until half-filled.

2. Screw thermistor into cold plate.

3. Plug connector into wiring harness.

4. Replace any cable ties cut during removal.

5. Apply power to column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

6. Observe fault indicators on PD box and SPM for column just serviced. No fault indicators should be lit. Correct any fault.

BS174-A/BS175-A High Temperature Thermistor Removal/Replacement - 7CX00086 - A

Required Items

The following items are required to perform this procedure:

Part Number	Item
Local supply	Diagonal cutting pliers
Local supply	Steel wool
Local supply	Cable ties
52855300	Insul grease

Introduction

Eight primary and back-up thermistors sense the temperature of the coolant tubes of each memory cage. A single thermistor senses the coolant temperature of the cabinet inlet coolant line. Because of the techniques used in mounting the thermistors, they are not readily visible.

Thermistor Removal

1. Remove power from memory cage by setting 400 Hz MASTER circuit breaker on 400-Hz power control box for cabinet to OFF.

2. Remove eight screws (four top and bottom) securing -4.7 V power adjust panel.

3. Swing the half of the panel that contains meter and circuit breaker out and disconnect two red (P1, P2) and two white (P3, P4) connectors. (Connectors are located inside open panel and toward hinge.)

4. Slide -4.7 V power adjust assembly carefully out of cabinet and set aside.

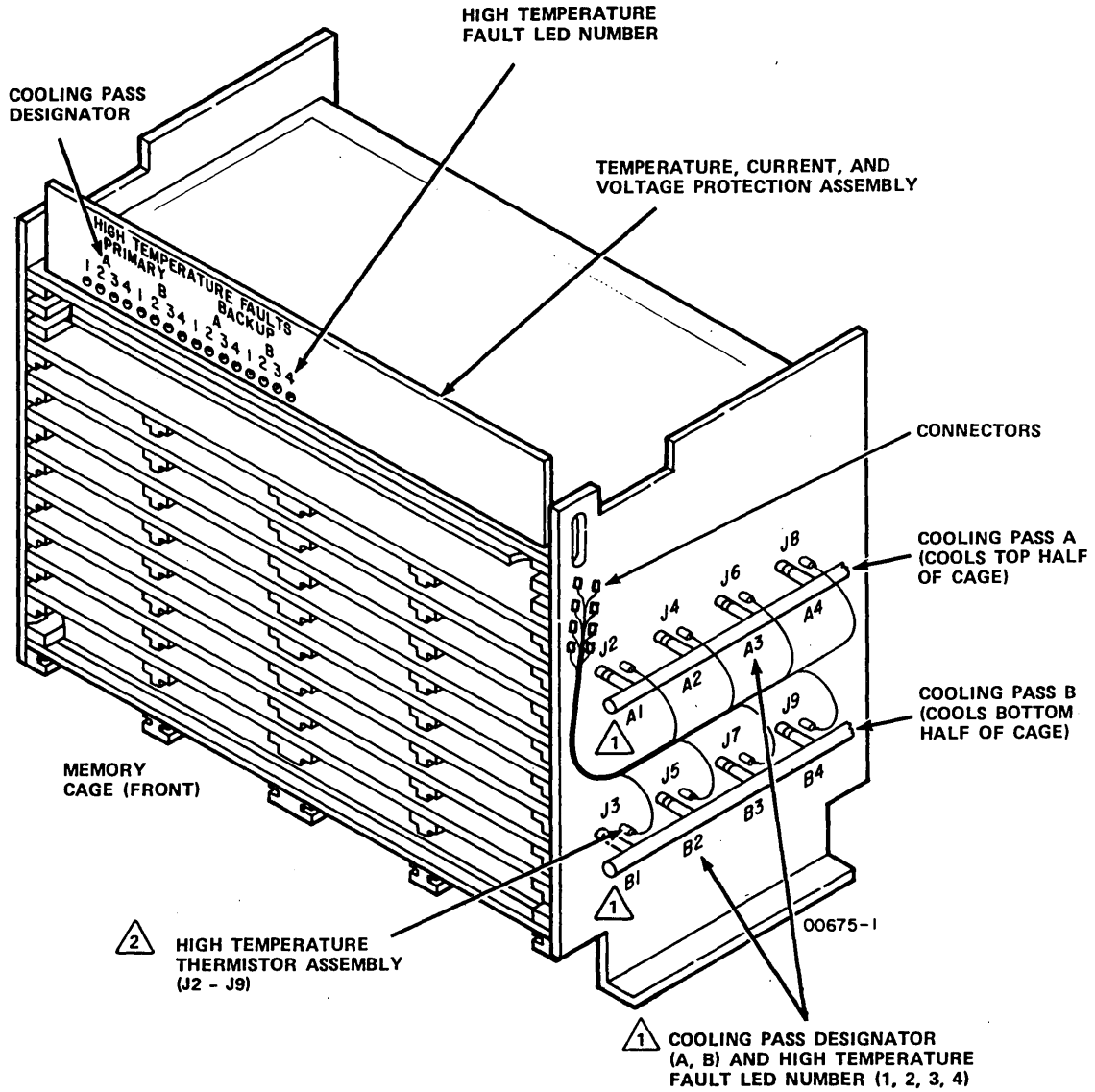
WARNING

Place a finger against cable tie before cutting to prevent it from snapping and causing injury.

5. Cut cable ties that hold thermistor and wires to coolant tube.

6. Follow wires from faulty thermistor to connectors (8 or 9 inches) and carefully disconnect the connectors.

7. Remove thermistor clip assembly from tube.



1 THE COOLING PASS DESIGNATOR (A, B) AND LED FAULT INDICATOR NUMBER (1, 2, 3, AND 4) ARE SHOWN FOR REFERENCE ONLY AND ARE NOT ON THE HARDWARE.

2 HIGH TEMPERATURE THERMISTOR ASSEMBLY CONSISTS OF A BACK-UP AND PRIMARY THERMISTOR.

EXAMPLE: IF THERMISTOR ASSEMBLY AT J2 SENSES A PRIMARY HIGH TEMPERATURE CONDITION, PRIMARY A1 FAULT LED LIGHTS.

BS174-A/BS175-A High Temperature Thermistor/LED Locations

Thermistor Replacement

CAUTION

Use care so that steel wool fibers are not allowed to remain in cabinet.

1. Clean coolant tube with steel wool where replacement slip will attach.
2. Apply insul grease to cleaned area of coolant tube.
3. Attach clip assembly with replacement thermistor to tube.
4. Plug in connector to wiring harness.
5. Fasten clip assembly and wires to tube with new cable ties.

NOTE

Connectors are keyed. Red connectors should mate with an audible snap.

6. Insert -4.7 V power adjust assembly carefully into cabinet.
7. Open -4.7 V power adjust panel-half containing meter and circuit breaker. Connect two red connectors and two white connectors to power adjust assembly.
8. Close -4.7 V power adjust panel and secure to cabinet with eight screws.
9. Set 400-Hz MASTER circuit breaker on 400-Hz power control box to ON.
10. Observe HIGH TEMPERATURE FAULTS indicators for memory cage. No fault indicator should be lit. Correct any fault.

Coolant Inlet Thermistor Removal

1. Remove power from memory cabinet by setting 400-Hz MASTER circuit breaker on 400-Hz power control box for cabinet to OFF.
2. Locate coolant inlet (SUPPLY) valve alongside 400-Hz power control box.
3. Cut cable tie just below valve and remove thermistor clip assembly from rear side of supply line.
4. Disconnect thermistor cable connector.

Coolant Inlet Thermistor Replacement

CAUTION

Use care so that steel wool fibers are not allowed to remain in cabinet.

1. Clean coolant tube mounting point (small-diameter tube soldered to rear of supply line) with steel wool where replacement clip will attach.
2. Apply insul grease to cleaned area of mounting point.
3. Attach clip assembly with replacement thermistor to mounting point.
4. Plug in connector to wiring harness.
5. Fasten clip assembly amd thermistor to supply line with new cable tie.
6. Set 400-Hz MASTER circuit breaker on 400-Hz power control box to ON.
7. Observe TEMP FAULT PRI LO indicator on power control assembly panel for cabinet. Indicator should not be lit. Correct any fault.

Chassis Column Thermostat Removal/Replacement - 7CX00076-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
95657900	Thermal grease (GE 641)

References

This procedure references the following procedure:

7CX00009 Chassis Column Power Removal/Application

Introduction

Each chassis column has a thermostat, S1, mounted on the power supply heat sink. The thermostat is accessed from the rear of the column. The thermostat is normally open. When the heat sink temperature equals or exceeds 150 °F, S1 closes which trips the 400-HZ DISCONNECT circuit breaker on the power distribution (PD) box.

Removal

1. Remove power from chassis column containing faulty thermostat according to Procedure 7CX00009, Chassis Column Power Removal/Replacement.

2. Remove two screws from lower corners of PD box mounting tray. Slide PD box out until it catches.

NOTE

Thermostat S1 is mounted to the left of diode CR13 on the heat sink.

3. Remove wires from S1.

4. Remove two small Phillips screws holding S1 to heat sink.

Replacement

Replacement consists of reversing removal procedure. In addition, apply a thin coat of GE641 thermal grease to both S1 and heat sink before replacement.

Chassis Column 3-V Transformer Removal/Replacement - 7CX00001-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
Local supply	Flat-blade screwdriver
Local supply	1/2-in combination wrench
Local supply	8-in adjustable wrench
Local supply	Ratchet wrench
Local supply	3/8-in socket
Local supply	6-in extender
Local supply	7/16-in socket
Local supply	3/8-in combination wrench
95353800	Electrical conductive grease (EJC No. 2)
12205640	Torque wrench (1000 lbf•in)

References

This procedure references the following procedures:

7CX00009 Chassis Column Power Removal/Application
7CX00003 Chassis Column PD Box Removal/Replacement

Introduction

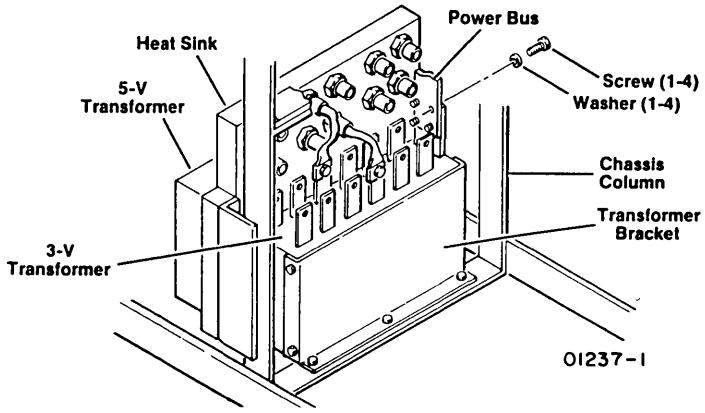
Each chassis column contains two 400-Hz power supply transformers, one for 3 volts and the other for 5 volts. This procedure covers the 3-V transformer which is accessed from the front of the column. The transformer has a side terminal block for 400-Hz input power connections and 12 terminals on top for output power connections. The output terminals connect to 12 power diodes (CR13-CR24) located behind the transformer. A vertical bus bar connects the transformer to the chassis column.

Removal

1. Remove power from chassis column containing faulty transformer according to Procedure 7CX00009, Chassis Column Power Removal/Application.

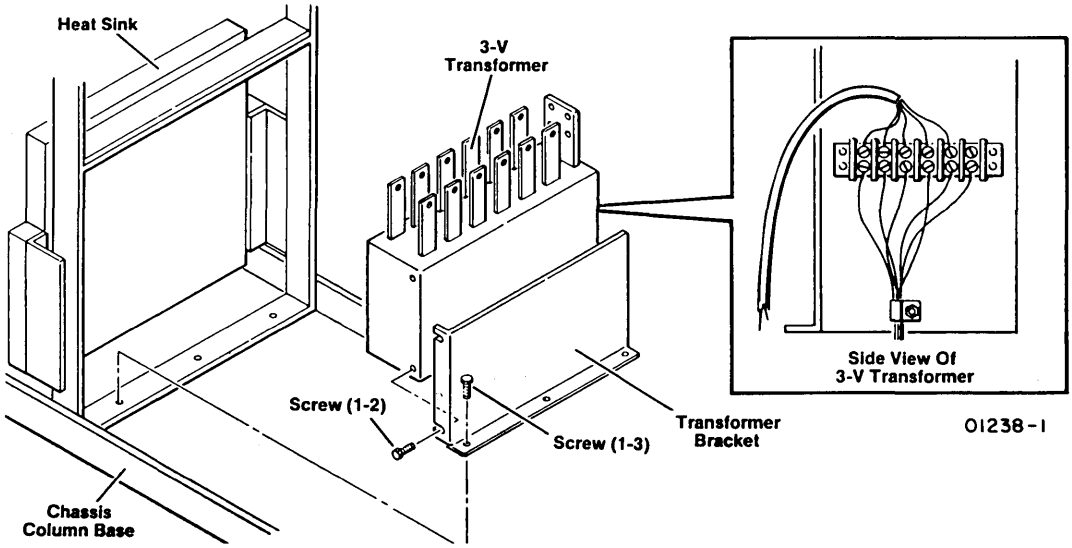
2. Remove power distribution (PD) box according to Procedure 7CX00003, Chassis Column PD Box Removal/Replacement.

3. Remove four screws, nuts, and washers connecting power bus to transformer, using 1/2-in combination wrench and adjustable wrench.



3-V Transformer and Power Bus Connections

4. Remove three screws holding transformer bracket to column base, using ratchet wrench, 6-in extender, and 3/8-in socket.



Column Base, Transformer, and Transformer Bracket

5. Remove four Phillips screws holding PD Box drawer slide to chassis column base. Remove slide.

6. Disconnect CR19-24 leads from associated transformer terminals, using ratchet wrench, 7/16-in socket, and 3/8-in combination wrench.

7. Remove ground lead (green) from heat sink adjacent to SCR1.

NOTE

It will be necessary to cut the cable ties on the wiring harnesses to the PD Box and the transformers before removing either transformer.

8. Pull transformer out far enough to loosen two screws in side of transformer bracket. Use 3/8-in combination wrench to loosen screws.

9. Remove transformer bracket.

10. Disconnect CR13-18 leads from associated transformer terminals, using ratchet wrench, 6-in extender, 7/16-in socket, and 3/8-in combination wrench.

11. Turn transformer as necessary to ease removal.

WARNING

Transformer weighs 41 kg (90 lbs), and requires two persons to lift it.

12. Pull transformer to front of column and lift out, taking care not to stretch wires connected to TB1.

13. Label wires on TB1 (on side of transformer) for later replacement. Remove wires from TB1.

Replacement

WARNING

Transformer weighs 41 kg (90 lbs), and requires two persons to lift it.

Replacement consists of reversing removal procedure except for the following:

1. Clean transformer terminals and bus bar surfaces, and apply EJC No. 2 electrical conductive grease to cleaned surfaces before assembly.

NOTE

Replace any cable ties clipped during removal procedure.

Chassis Column 5-V Transformer Removal/Replacement - 7CX00002-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
Local supply	Flat-blade screwdriver
Local supply	Ratchet wrench
Local supply	1/2-in socket
Local supply	1/2-in combination wrench
Local supply	5/16-in socket
Local supply	9/16-in socket
Local supply	8-in adjustable wrench
Local supply	7/16-in combination wrench
Local supply	3/8-in combination wrench
95353800	Electrical conductive grease (EJC No. 2)
12205640	Torque wrench (1000 lbf•in)

References

This procedure references the following procedures:

7CX00009 Chassis Column Power Removal/Application
7CX00019 Chassis Column Power Multiplexer Removal/Replacement

Introduction

Each chassis column contains two 400-Hz transformers, one for 3 volts and the other for 5 volts. This procedure covers the 5-V transformer which is accessed from the rear of the column. The transformer has a side terminal block for 400-Hz input power connections and 12 terminals on top for output power connections. The output terminals connect to 12 power diodes (CR1-CR12) located behind the transformer. A vertical bus bar connects the transformer to the chassis column.

Removal

1. Remove power from chassis column containing faulty transformer according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Remove transformer cover according to applicable substep:

   For perforated covers (LSI columns), remove four screws at the corners and two screws on top.

   For three-piece solid covers (ZIF columns):

   a. Remove two screws at bottom of square cover, slide cover down. Remove cover.

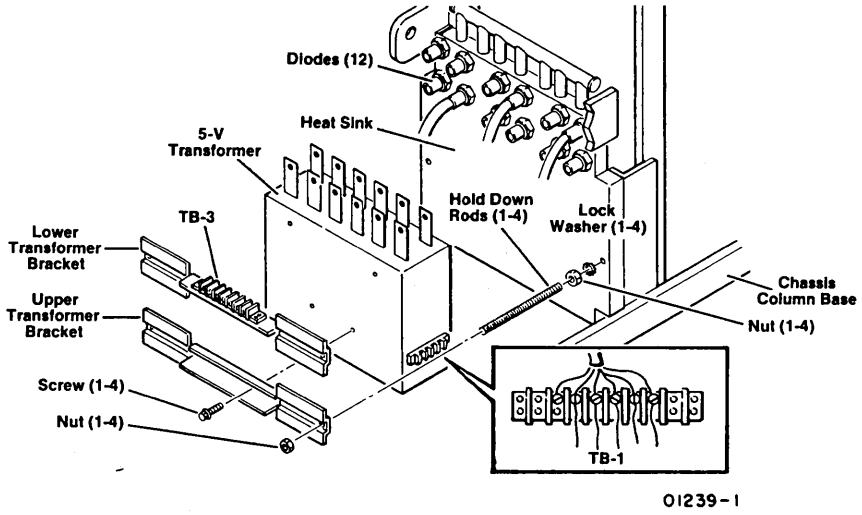
   b. Remove four screws at the corners of cover frame and remove frame. Wire tray sits on top of cover frame and is not attached.

   c. Remove power multiplexer board according to Procedure 7CX00019, Power Multiplexer Board Removal/Replacement.

3. Disconnect 12 diode leads from transformer terminals using 1/2-in socket and 1/2-in combination wrench.

4. Remove yellow wires from TB3-7, 8. Remove red and white wires from TB3-9, 10.

5. Remove two nuts from both transformer brackets, using ratchet wrench and 9/16-in socket.



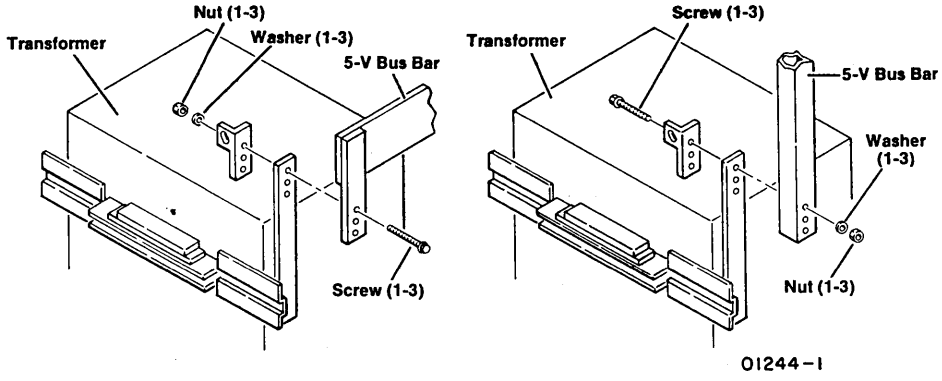
5-V Transformer and Transformer Bracket

6. Remove two screws from both transformer brackets, using ratchet wrench and 5/16-in socket. Move upper bracket aside, ensuring that remaining wires to TB3 are not damaged.

7. Remove screws, nuts, and washers connecting power bus to transformer according to applicable substep:

   a. For LSI columns, use 7/16-in combination wrench on nut, and 3/8-in combination wrench on screw.

   b. For ZIF column, use 1/2-in combination wrench on nut, and ratchet wrench with 1/2-in socket on screw.



5-V Transformer and Power Bus Connection

NOTE

Cut cable ties as necessary to allow slack in wiring harness connected to TB1 on transformer.

8. Remove ground wire from column base (adjacent to TB1).

WARNING

Transformer weighs 50 kg (110 lbs) and requires two persons to lift it.

9. Tilt and lift transformer out of column, taking care not to stretch wiring harness connected to TB1.

10. Label all wires to TB1 on side of transformer for later replacement. Remove wires from TB1.

Replacement

WARNING

Transformer weighs 50 kg (110 lbs) and requires two persons to lift it.

Replacement consists of reversing removal procedure except for the following:

1. Clean transformer and bus bar surfaces and apply thin layer of EJC No. 2 electrical conductive grease to cleaned surfaces.

2. Torque nuts on upper and lower transformer brackets to 14 N•m (120 lbf•in).

NOTE

Replace any cable ties clipped during removal procedure.

LSI Panel Current Regulator Removal/Replacement - 7CX00017-B

Required Items

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
Local supply	Long-shank Phillips screwdriver
12263499	Antistatic bag
94657900	Thermal grease (GE 641)
95353800	Electrical conductive grease (EJC No. 2)
Local supply	Tape (masking or electrical)

References

This procedure references the following procedures.

7CX00009	Chassis Column Power Removal/Application
7CX00008	LSI Panel Removal/Replacement

Introduction

A current regulator board mounts just below the front of each LSI panel assembly. The board receives -2.7 V from a bus bar and supplies -2.2 V to the panel assembly.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

Removal

1. Remove power from chassis column containing current regulator board according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Remove LSI panel assembly and lead-in board according to Procedure 7CX00008, LSI Panel Removal/Replacement.

3. Put on antistatic wrist strap and connect it to chassis ground.

4. Remove cover plate from current regulator board by removing two mounting screws with lock washers.

5. Disconnect short reverse-angle connecting bus, located at right-front corner of current regulator board, from -2.7 V bus. This requires removal of three screws and related fasteners.

6. Remove four screws and lock washers that fasten bottom mounting bracket of current regulator board to cold bar.

7. Loosen five screws that fasten current regulator board top mounting bracket to chassis. Do not loosen screws to left and right of five screws.

8. Tilt current regulator board to clear screw slots on top mounting bracket. Pull regulator board and attached brackets and capacitors from chassis.

NOTE

Strapping connections between the current regulator board and the short reverse-angle connecting bus are unique to each board. These connections must be the same on a replacement board. Note these connections and compare them to a replacement board to ensure they are the same.

A replacement board also requires the installation of three large capacitors and associated mounting hardware that must first be removed from the removed current regulator board.

9. Wipe off all electrical and thermal grease from current regulator board hardware and from its contact surfaces in cabinet.

10. Place regulator board in an antistatic bag.

Replacement

1. Put on antistatic wrist strap and connect it to chassis ground.

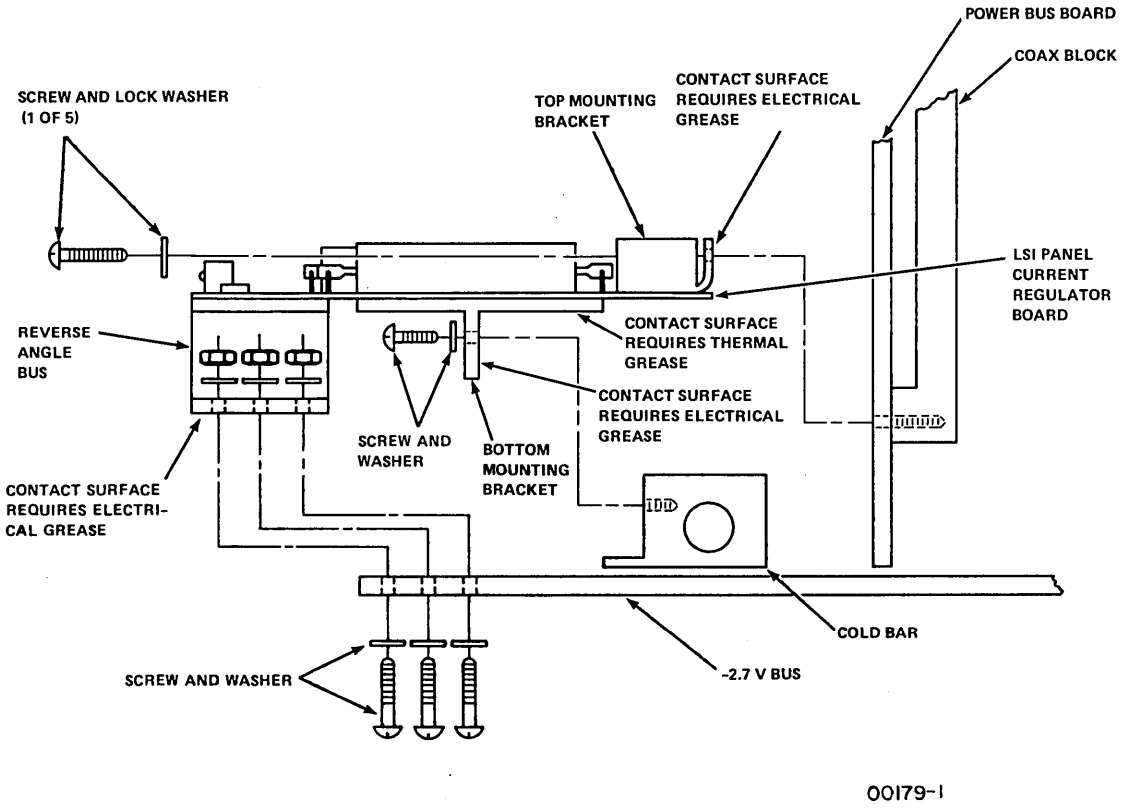
2. Remove new regulator board from antistatic bag. If board is greasy, dispose of bag to prevent reuse.

3. Change (as required) strapping connections on new current regulator board to match those on old board. If lead between large resistor and board foil is cut on old board, cut corresponding lead on new board.

4. Remove three large capacitors and associated hardware from old current regulator board and install them on new board.

5. Apply CJ2 electrical conductive grease to hardware surfaces of current regulator board as indicated in figure.

6. Apply GE 641 thermal grease to hardware surfaces of current regulator board as indicated in figure.



LSI Current Regulator Board Installation

7. Place current regulator board in chassis.

8. Install four screws and lock washers through bottom mounting bracket. Use tape, if desired, to hold each screw on end of screwdriver until screw is started in hole.

9. Tighten five screws against top mounting bracket.

10. Connect short reverse-angle connecting bus to -2.7 V bus with three screws and related fasteners.

11. Install cover plate over current regulator board.

Supplemental Information

Below are placement and current setting requirements for the 80-A and 160-A current regulators used in the Model 990 (referred to as model A) and CYBER 990E and 995E (referred to as B models).

CONTROL DATA CORPORATION	THETA REGULATOR PLACEMENT AND CURRENT SETTINGS	CODE IDENT 34010	SHEET 2		DOCUMENT NO. 53535651	REV. C

	CHASSIS 1					CHASSIS 2					CHASSIS 3
	1-1	1-2	1-3	1-4	1-5	2-1	2-2	2-3	2-4	2-5	3-1
A	△ 45A	△ 45A	△ 45A	△ 45A	△ 45A	△ 75A	△ 45A	△ 45A	△ 75A	△ 60A	□ 135A
B	△ 60A	△ 30A-MOD.A 60A-MOD.B	△ 75A	△ 75A	△ 75A	△ 45A	△ 60A	□ 135A	△ 45A	□ 90A	□ 105A
C	△ 75A	△ 60A	△ 45A	△ 45A	△ 45A	△ 60A	△ 75A	△ 45A	△ 60A	□ 105A	□ 105A
D	□ 135A	△ 75A	△ 45A	△ 75A	△ 45A	△ 45A	□ 105A	□ 105A	△ 75A	△ 60A	□ 105A

△ 22679417

□ 67327677

△ 30A = Only R60 Connected

△ 45A = R60 + R62 Connected

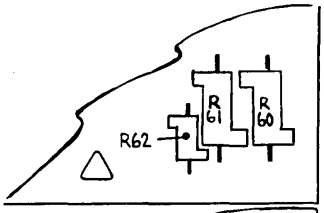
△ 60A = R60 + R61 Connected

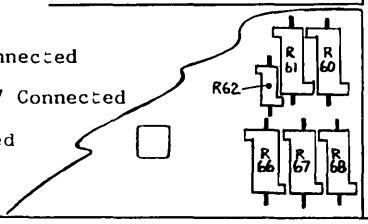
△ 75A = R60+R61+R62 Connected

□ 105A = R60+R61+R62+R66 Connected

□ 135A = R60+R61+R62+R66+R67 Connected

□ 90A = R60+R61+R66 Connected





NOTES:
1. WHEN CONNECTING OR DICONNECTING RESISTORS USE A 50W SOLDERING IRON AND MAKE THE CONNECTION OR DISCONNECTION AT THE RESISTOR NOT AT THE BUS BAR OR ON THE BOARD.

Current Regulator Placement and Settings

LSI Temperature-Protect Board Removal/Replacement - 7CX00021-B

Required Items

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag

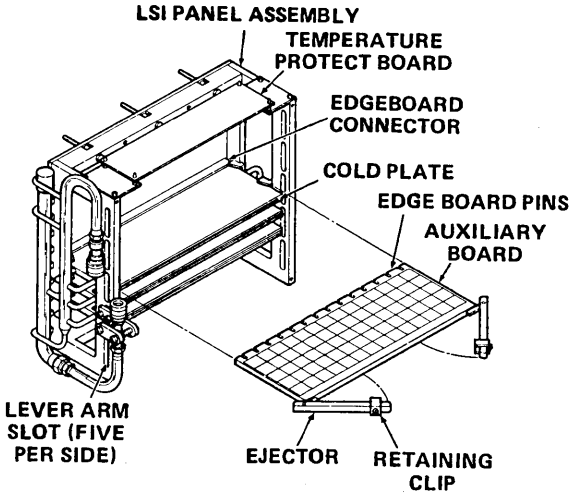
Reference

This procedure references the following procedure.

7CX00009 Chassis Column Power Removal/Application

Introduction

Each LSI panel assembly has a temperature-protect board at the top front of the assembly. Light-emitting diodes on the front of the board indicate high and low temperature conditions in the panel assembly. Use the following procedures to remove and replace the board.



Temperature-Protect Board

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

Removal

1. Remove power from chassis column containing temperature-protect board according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Put on antistatic wrist strap and connect it to chassis ground.

3. Remove cover from temperature-protect board.

4. Disconnect cable connector from left end of temperature-protect board.

5. Disconnect cable connector that connects temperature-protect board to current regulator board.

6. Release temperature-protect board by lifting each corner of board from its plastic mounting stud. Studs may come out with board.

7. Pull temperature-protect board slightly away from LSI panel assembly, then disconnect cable connector from right side of board.

8. Place board in an antistatic bag.

9. Remove antistatic wrist strap.

Replacement

Replacement consists of reversing the removal procedure.

Power Multiplexer Board Removal/Replacement - 7CX00019-B

Supplemental Information (AD118-A)

This supplement gives the location of the power multiplexer board in the AD118-A processor.

Location

The power multiplexer board is located in chassis column 1.

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver

References

This procedure references the following procedure:

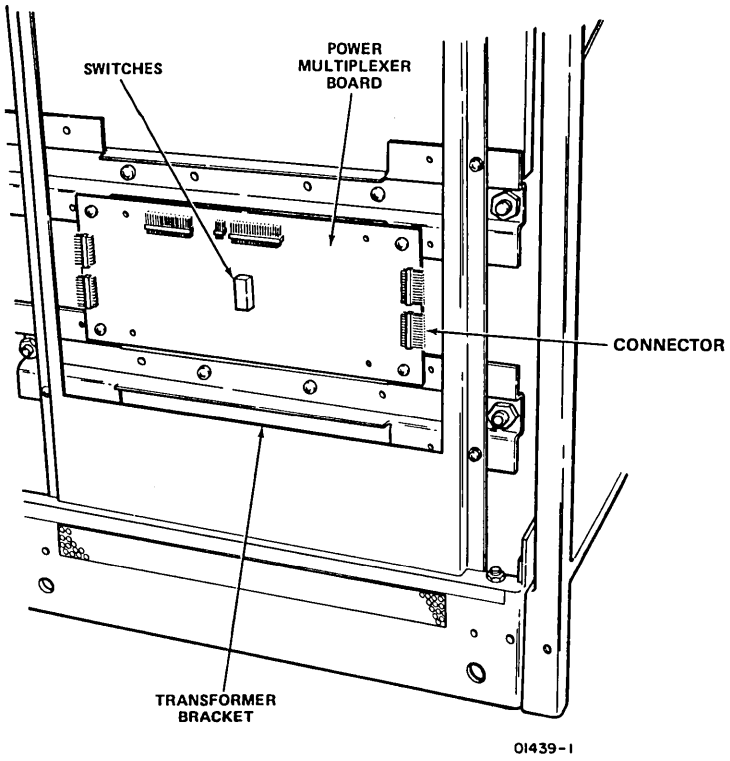
7CX00009 Chassis Column Power Removal/Application

Introduction

The power multiplexer board interfaces the system power monitor (SPM) to the chassis columns. The board has switches to identify the columns and to identify the water cooling unit to which the columns are connected. The power multiplexer board mounts to the transformer brackets at the back of the column.

Removal

1. Remove power from chassis column containing power multiplexer board according to Procedure 7CX00009, Chassis Column Power Removal/ Application.
2. Remove transformer cover from column by removing two screws from bottom of cover and sliding cover down.
3. Unplug connectors from ends of board.



Power Multiplexer Board

4. Remove board from transformer brackets.

Replacement

Replacement consists of reversing removal procedure. In addition, set switches on replacement board same as on removed board.

ZIF Temperature-Protect Board (A) Removal/Replacement (AD118-A Serial Numbers 101 and 102) - 7CX00040-A

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag

References

This procedure references the following procedure:

7CX00009 Chassis Column Power Removal/Application

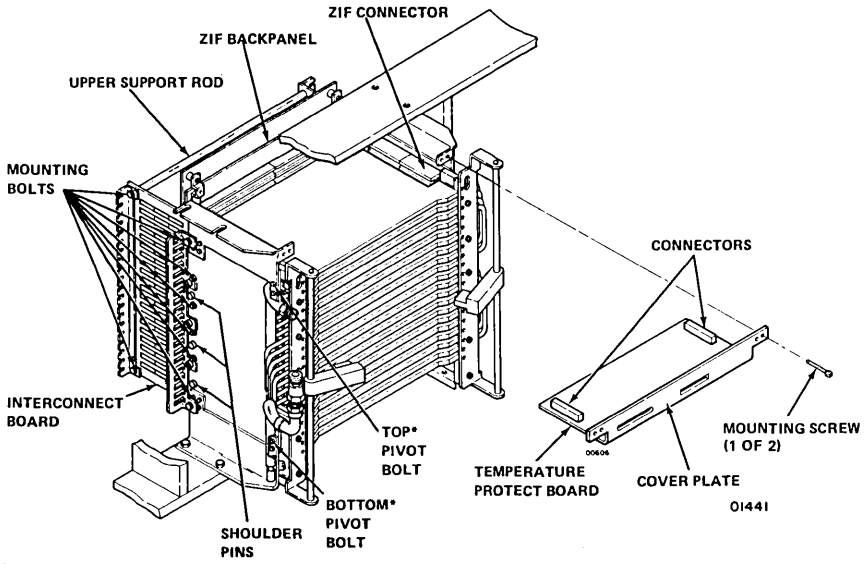
Introduction

The temperature-protect board monitors the temperature of the return water tubes in the cold plate assembly of a ZIF cage. Five LEDs indicate a primary high temperature fault, and five LEDs indicate a back-up high temperature fault. In each group, the LEDs from left to right represent the water tubes from top to bottom. The temperature-protect board mounts behind a cover above each ZIF cage.

This procedure applies to a temperature-protect board with a cover that mounts to the ZIF cage with four mounting screws. Procedure 7CX00033, ZIF Temperature-Protect Board (B) Removal/Replacement, applies to a temperature-protect board that mounts to the ZIF cage with two mounting screws.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.



* FOR ALIGNMENT OF LOWER BOARD, DO NOT LOOSEN TOP PIVOT BOLT
FOR ALIGNMENT OF UPPER BOARD, DO NOT LOOSEN BOTTOM PIVOT BOLT

ZIF Cage and Temperature-Protect Board

Removal

1. Remove power from chassis column containing ZIF cages according to Procedure 7CX00009, Chassis Column Power Removal/Application.
2. Put on antistatic wrist strap, and connect it to chassis ground.
3. Remove four mounting screws and lockwashers from temperature-protect board cover.
4. Pull cover out slightly, and unplug connectors on right and left ends of board.
5. Remove cover and board from ZIF cage.
6. Remove six nuts and lockwashers from mounting screws that hold board to cover.
7. Lift board from mounting screws.
8. Place board in antistatic bag.
9. Remove antistatic wrist strap.

Replacement

Replacement consists of reversing removal procedure.

ZIF Temperature-Protect Board (B) Removal/Replacement (AD118-A Serial Numbers 103 and above) - 7CX00033-B

Required Items

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag

References

This procedure references the following procedure:

7CX00009 Chassis Column Power Removal/Application

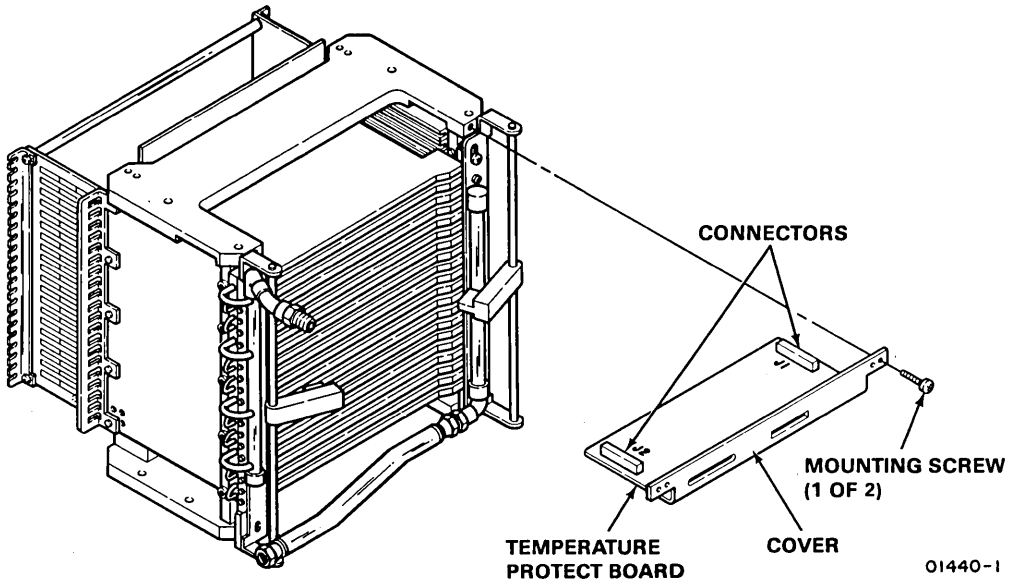
Introduction

The temperature-protect board monitors the temperature of the return water tubes in the cold plate assembly of a ZIF cage. Five LEDs indicate a primary high temperature fault, and five LEDs indicate a back-up high temperature fault. In each group, the LEDs from left to right represent the water tubes from top to bottom. The temperature-protect board mounts behind a cover above each ZIF cage.

This procedure applies to a temperature-protect board with a cover that mounts to the ZIF cage with two mounting screws. Procedure 7CX00040, ZIF Temperature-Protect Board (A) Removal/Replacement, applies to a temperature-protect board that mounts to the ZIF cage with four mounting screws.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.



ZIF Cage and Temperature-Protect Board

Removal

1. Remove power from chassis column containing ZIF cages according to Procedure 7CX00009, Chassis Column Power Removal/Application.
2. Put on antistatic wrist strap, and connect it to chassis ground.
3. If temperature-protect board is being removed from ZIF cage A, go to step 4. Otherwise, remove plastic cover from supply water hose above temperature-protect board.
4. Remove two mounting screws and lockwashers from temperature-protect board cover.
5. Pull cover out slightly, and unplug connectors on right and left ends of board.
6. Remove cover and board from ZIF cage.
7. Remove six nuts and lockwashers from mounting screws that hold board to cover.
8. Lift board from mounting screws.
9. Place board in antistatic bag.
10. Remove antistatic wrist strap.

Replacement

Replacement consists of reversing removal procedure.

Tables 7-1 and 7-2 are field replaceable unit (FRU) parts lists for the column and SPM. Parts are common between LSI and ZIF columns except as noted.

Table 7-1. Column FRU Parts List

Part Number	Description
00815800	Knob Bar Type .25-In
10126956	Transformer 5.15-V, 750A
11802900	Diode Silicon
15182087	Transformer 3.0-V, 500A T2
12089335	Socket Relay and Spring
12117309	Cap alum 10-V Elect
12117700	Cap 50. KUF 30-V Elect
15005251	Circuit Breaker 20A 400-Hz
15005252	Circuit Breaker 30A 400-Hz (ZIF - CYBERPLUS only)
16431600	Rectifier
17620001	Jack Banana Red
17620004	Jack Banana Blk
18287502	Diode, Silicon
18440706	Circuit Breaker 7.5A (ZIF - CYBERPLUS only)
18440714	Circuit Breaker 15A 4P 250-V 400-Hz
18440715	Circuit Breaker 20A (ZIF - CYBERPLUS only)
18440720	Circuit Breaker 4P 400-Hz 5A
18906200	Relay Power 35A 4PDT E
18906894	Thermistor Bead
18906894	Mod Assy Temp-Protect (LSI)
20290300	Bridge Rect
22679417	Regulator Assy 2.2-V
22932938	Capacitor Tant Electrolytic
22932939	Capacitor Tant Electrolytic
22934306	Retaining Spring LSI 48 Pin
22934703	Ground Clip for Aux Mod
23102208	Mod Assy Temp Protect (ZIF)
24500046	Res 200 OHM .250W 5P FCM
24553368	Resistor WW 50W 0.016 OHM
24530220	Resistor 1/8 W Aux Board
24563068	Resistor 75 OHM .125W 5P FCM
24564224	Thermostat
30090600	Trans Var 120-V 3K VA
38963902	Test Jack Black
51001131	Cap .10 uf 500-V CER
51683710	Circuit Breaker, SP250-V
52757000	Transformer 24-V 400-Hz (ZIF - CYBERPLUS only)
52807821	Contactor 40A 50-400-Hz
53582609	Thermistor Kit (LSI)
53582649	Thermistor Kit (ZIF)
67327899	Power Control Assy
77964870	CRP/MMI Interconnect A
77964970	CRP/MMI Interconnect B

Table 7-2. SPM FRU Parts List

Part Number	Description
00815701	Knob
00852001	Muffin Fan
10129651	Receptacle 9 Pos
10129653	Receptacle 25 Pos
15182088	Isolation Transformer
15182089	Transformer 361186112A
17981203	PB Switch
17981206	PB Switch
18979500	Audible Alarm
24511001	Momentary PB Switch
24534900	Coax Receptacle
24538100	Rotary Switch
24571900	Toggle SW 2 Po DPDT
51683710	Circuit Breaker 250-V 1A
51683720	Circuit Breaker 5A
52573807	Meter Elapsed Time
52807008	Transmitter, R/H and Temp
52807009	Sensor Probe, R/H and Temp
53052701	Keyswitch
67327671	Mod Assy Sys Pwr Control - Board A4 (LEDs)
67327673	Mod Assy Sys Pwr Control - Board A2 (relays)
67327675	Mod Assy Sys Pwr Control - Board A1 (EPROM)
93700312	Rheostat 100 OHM .35
96744777	RFI Filter

COMMENT SHEET

CDC CYBER 180, Models 840, 850, 860, 990 Computer Systems; CYBER 845S, 855S, 840A, 850A, 860A, 990E, 995E Computer Systems; and CYBERPLUS Parallel Processor PD & W HMM

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